News of the Industry Begins Page 440

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Volume 68 Number 14

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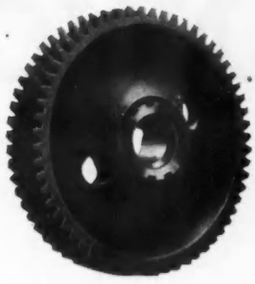
TEXTOLITE TIMING GEARS



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GENERAL ELECTRIC

ANNOUNCEMENT

The American Stainless Steel Company of Pittsburgh, Pennsylvania, is filing an appeal with the United States Circuit Court of Appeals at Baltimore in its infringement suit against the Rustless Iron Corporation of America.

The Hamilton and Evans process patent owned by this company was held by the lower court to be invalid because its essential features are said to be the same as those of an earlier patented process for producing ferro chromium. • The following excerpt from the court's decision is significant: "Having found the Hamilton and Evans patent invalid, it becomes unnecessary to discuss the question of infringement, although we are satisfied from the evidence that the plaintiffs (American Stainless Steel Co.) have sustained the burden of proving that the process of manufacture followed by the defendant (Rustless Iron Corporation of America) under the Wild patent No. 1586591 is in all material respects a duplication of the Hamilton and Evans process."

The court held the Clement patent on Stainless Iron under which suit was brought to be invalid because of an earlier patent on apparently similar material granted to Elwood Haynes.

This opinion creates an interesting situation because of the fact that the Haynes patent is also owned by the American Stainless Steel Co.

Genuine Stainless Steel is manufactured only under the patents of the

AMERICAN STAINLESS STEEL CO.

AUTOMOTIVE INDUSTRIES

Vol. 68, No. 14 • THIRTY-FIFTH YEAR • April 8, 1933

38,092 Answer "HERE"

In Chilton Company's Annual Roll Call of the Industry's Dealer Organization

by Don Blanchard
Editor, Automotive Industries

THE vitality of the industry's dealer organization in the face of a continued adverse sales trend, is one of the amazing automotive phenomena of the depression. After three years of steadily contracting volume, the annual count of the Chilton Trade List shows that the factories had at the end of 1932, 38,092 retail outlets through which to distribute their passenger car production as compared with 42,881 a year earlier and with the peak 1929 figure of 51,560. Numerically the decreases amount respectively to 4789 and 13,468, and in percentage to 11 and 26.

Individual manufacturers have been able to maintain the scope of their distribution even better than these comparisons indicate, due to the steadily growing tendency for dealers to sell more than one line of cars. As a result of this trend, totalling the retail representations of all the manufacturers shows that they had 53,437 at the end of 1932 against 59,173 in 1931 and 62,741 in 1929. The corresponding percentage losses are 10 and 15 which are substantially less than the decreases in the numbers of dealers.

As a consequence of these changes, the average number of lines handled per dealer was 1.40 in 1932 against 1.22 in 1929. Moreover, in 1929, 80 per cent of the representations were provided by dealers handling *one* line while in 1932 the corresponding percentage was only 66. The seven year trend in these relationships is shown in Figs. 1 and 2.

According to Table I, in 1929, only 10,192 dealers sold more than one line while in 1932 there were 13,086 in this category. During the same period the number of dealers selling *only* one line dropped for 41,368 to 25,006, a decrease of 40 per cent against an increase of 28 per cent in the number of multiple-line dealers.

If Ford and Chevrolet are excepted, the extent of the "doubling-up" is even more striking. These two leaders in the low-priced field in 1932 had 14,486 exclusive dealers leaving only 10,520 for all other lines combined. Inasmuch as all lines combined, except Ford and Chevrolet, had 36,118 representations at the end of last year, 25,598,

Table I The Roll Call*

(*End of the Year Figures*)

	1926	1927	1928	1929	1930	1931	1932
Number of Dealers	50,868	51,440	50,984	51,560	47,144	42,881	38,092
Number of Representations*	60,378	62,387	62,872	63,054	62,741	59,173	53,437
Number of Exclusive Dealers	41,799	45,464	40,314	41,368	34,044	28,594	25,006
Number of Multiple-line Dealers	9,069	5,976	10,670	10,192	13,100	14,287	13,086
Number of Representations by Multiple-line Dealers	18,579	16,923	22,558	21,686	28,697	30,579	28,431

* There are more representations than dealers, because some dealers handle more than one line—each line handled counting as a representation.

Table II

Passenger Car Representations by Makes

(*End of the Year Figures*)

	1926	1927	1928	1929	1930	1931	1932
Chevrolet	7,738	8,381	8,987	9,553	9,558	9,412	9,039
Ford	9,376	9,375	8,731	8,598	8,833	8,735	8,280
Total	17,114	17,756	17,718	18,151	18,391	18,147	17,319
Plymouth	....	....	....	....	7,218*	7,351*	6,276*
Chrysler	2,975	3,455	3,647	3,337	3,007	3,454	2,999
Willys-Overland	4,306	4,295	4,669	4,751	3,783	2,904	2,739
Dodge	3,692	3,667	3,212	2,994	2,842	2,663	2,722
Pontiac	2,627	3,273	4,386	4,545	3,435	2,887	2,503
Buick	3,614	3,597	3,533	3,241	3,003	2,608	2,472
Studebaker	2,850	2,546	2,262	2,242	1,971	1,999	1,927
Hudson-Essex	3,842	3,754	3,508	3,488	2,863	2,270	1,761
Nash	2,196	2,280	1,986	2,123	1,884	1,677	1,430
Oldsmobile	1,685	1,845	1,656	1,668	1,592	1,426	1,351
De Soto	....	....	307	1,133	1,369	1,234	1,252
Lincoln	4,380	3,964	3,367	2,780	2,033	1,440	1,194
Rockne	....	....	....	....	....	....	1,099
Graham	1,955	1,389	1,492	1,751	1,469	1,206	1,079
Hupp	1,356	1,291	1,265	1,296	1,084	991	854
Auburn	448	452	525	702	581	1,117	780
Reo	1,112	1,093	1,119	870	772	1,079	756
Packard	750	739	762	776	721	682	624
Cadillac	823	815	762	722	700	654	602
Pierce-Arrow	271	244	214	266	312	449	385
Franklin	421	404	350	343	315	265	246
Marmon	295	345	540	830	663	377	242
Total Ex. Ford and Chevrolet	39,598	39,448	39,562	39,858	41,617	38,733	35,293
Unclassified†	3,666	5,183	5,592	5,045	2,733	2,293	825
Total	60,378	62,387	62,872	63,054	62,741	59,173	53,437

*Total of Chrysler, De Soto and Dodge.
† Unclassified includes representations of cars no longer produced.

Table III

Exclusive and Multiple-Line Dealers

(*End of the Year Figures*)

Cars	Dealers Handling This Make Exclusively Per Cent Change 1931	1932		Dealer Representation Handling This Make and in Addition One or More Makes of Any Other Cars Per Cent Change 1931	1932	
Auburn	554	358	—35	563	422	—25
Buick	1,536	1,139	—26	1,072	1,333	+24
Cadillac	230	183	—20	424	419	— 1
Chevrolet	7,794	7,718	— 1	1,618	1,321	—18
Chrysler	...	...	..	3,454	2,999	—13
De Soto	...	...	..	1,234	1,252	+ 1
Dodge	...	...	..	2,663	2,722	+ 2
Ford	6,881	6,768	— 2	1,854	1,512	—18
Franklin	141	117	—17	124	129	+ 4
Graham	758	639	—16	448	440	— 2
Hudson-Essex	1,603	1,259	—22	667	502	—25
Hupmobile	539	459	—15	452	395	—13
Lincoln	37	51	+38	1,403	1,143	—18
Marmon	169	113	—33	208	129	—38
Nash	1,064	896	—16	613	534	—13
Oldsmobile	822	654	—20	604	697	+12
Overland-Knight	1,899	1,813	— 4	1,005	926	— 8
Packard	311	240	—22	371	384	+ 3
Pierce-Arrow	71	41	—42	378	344	— 9
Plymouth	...	...	..	7,351	6,276	—15
Pontiac	1,811	1,370	—24	1,076	1,133	+ 5
Reo	406	310	—24	673	446	—34
Rockne	...	103	..	...	996	..
Studebaker	1,048	586	—48	951	1,341	+41
Miscellaneous	920	189	..	1,373	706	..
Totals	28,594	25,006	—13	30,579	28,431	— 7

Table IV

Passenger Car Dealer Representation By Population Group

(*End of the Year Figures*)

CAR MAKE	0 to 10,000	10,000 to 50,000	50,000 to 100,000	Over 100,000	Total Dealer Representation
Auburn	308	256	65	150	780
Buick	1,679	525	98	170	2,472
Cadillac	176	259	73	94	602
Chevrolet	7,786	711	118	424	9,039
Chrysler	2,152	510	87	250	2,999
De Soto	609	342	74	227	1,252
Dodge	1,794	568	96	264	2,722
Ford	6,843	683	154	600	8,280
Franklin	44	92	30	80	246
Graham	506	325	79	169	1,079
Hudson-Essex	1,090	393	78	200	1,761
Hupmobile	384	256	62	152	854
Lincoln	814	230	47	103	1,194
Marmon	92	76	26	48	242
Nash	765	383	86	196	1,430
Oakland-Pontiac	1,714	461	92	236	2,503
Oldsmobile	744	353	72	182	1,351
Overland-Knight	2,011	429	80	219	2,739
Packard	175	281	67	101	624
Pierce-Arrow	109	157	45	74	385
Plymouth	4,333	1,155	204	584	6,276
Reo	375	211	64	106	756
Rockne	607	319	59	114	1,099
Studebaker	1,169	501	98	159	1,927
Miscellaneous	419	217	56	133	825
1932—Total	36,698	9,693	2,011	5,035	53,437
—% of Total	68.7	18.1	3.8	9.4	100.0
1931—Total	40,882	10,590	2,174	5,527	59,173
—% of Total	69.2	17.8	3.7	9.3	100.0
% Decrease — 1932 from 1931	—10	—8	—7	—9	—10
1932—Ford, Chevrolet and Plymouth	18,962	2,549	476	1,608	23,595
1932—All others	17,736	7,144	1,535	3,427	29,842
% of Total	59.5	23.9	5.1	11.5	100.0

or 71 per cent of their outlets, were provided by multiple-line dealers.

As Table II indicates, the expansion during the depression of the portion of the market going to low-priced makers, has helped Ford and Chevrolet to maintain the scope of their distribution relatively unimpaired. The combined total of their outlets at the close of 1932 was only 4.5 per cent less than in 1929. All other lines combined on the other hand, show a decrease of 11.5 per cent.

Viewed from another angle, the 1932 figures credit Ford with 15.2 per cent of the representations, Chevrolet with 17.3 per cent and Plymouth with 11.8 per cent. This aspect of the situation is shown graphically in Fig. 3. Table III shows how the tendency for dealers to handle more than one line has affected individual makers in the last two years.

Numerically the bulk of the industry's outlets are in towns of 10,000 or less, 68.7 per cent being in this population group as compared with 69.2 per cent in 1931. Excluding Ford, Chevrolet and Plymouth, however, only 59.5 per cent of the outlets of the remaining manufacturers are in the 10,000 or less group. The 50,000 to 100,000 group shows the smallest percentage loss from 1931 but the percentage decreases of all four population groups are so nearly alike that the differences probably are of no significance.

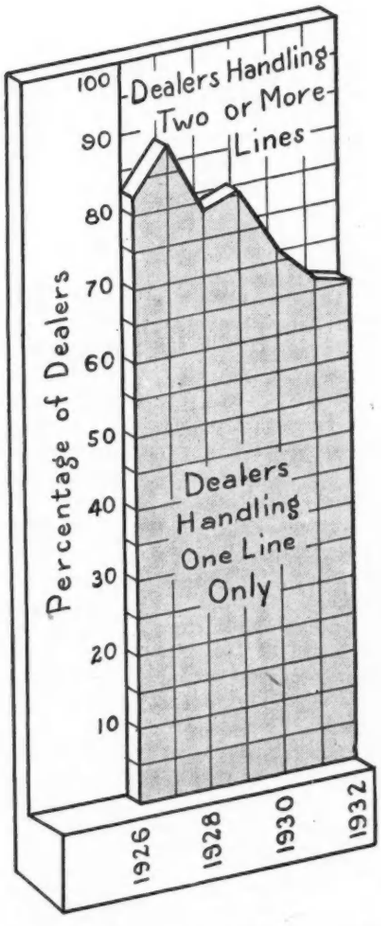


Fig. 1—The percentage of dealers handling more than one line has increased steadily since 1929.

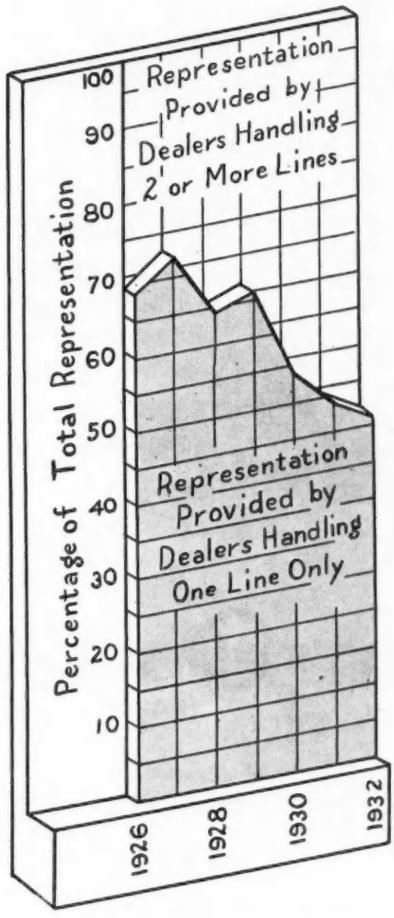


Fig. 2—Approximately half of the industry's dealer representations are now provided by multiple-line dealers.

Any reversal in the tendencies of the last three years, as portrayed by the figures presented here, is unlikely during the current year. Almost certainly, 1933 will bring another decrease in the numbers of the industry's dealers and a further increase in the number of dealers handling more than one line of cars.

Although the first of these trends will intensify the distribution problems of individual manufacturers, some more than others, for the industry as a whole both tendencies must be regarded as constructive and in the direction of rationalization.

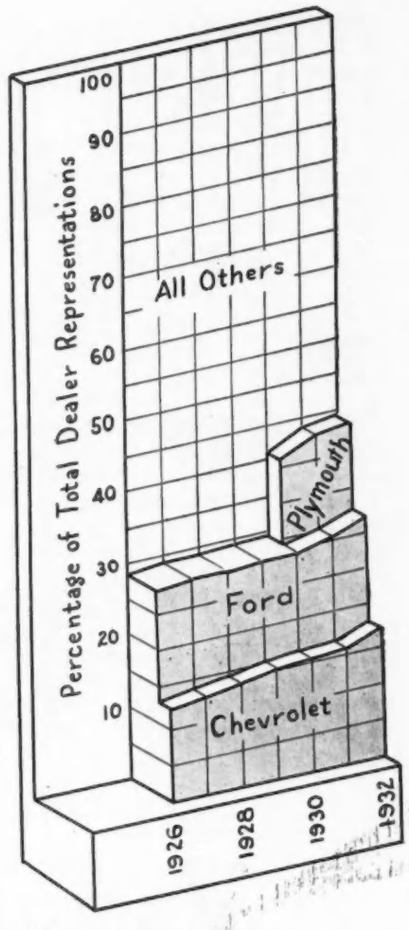


Fig. 3—Nearly 45 per cent of the representations are accounted for by Chevrolet, Ford and Plymouth.

One of the primary reasons for continued over-allowances on used cars, and consequent loss on combined new and used car sales, is the unbalance between sales potential and total retail overhead charged to car sales. Economic law, as the figures presented here indicate, has been and is operating to restore the balance. The decrease in the number of dealers increases the sales potential of those who remain, while handling two or more lines, instead of one, decreases the overhead per unit.

The process fortunately is being accelerated in some cases by far-seeing sales executives who recognize the relationships between total retail overhead, sales potentials and used car trading practices. These executives are working to bring these elements into concord so that their dealers will be on a fundamentally sound basis. Over the long swing, there is no surer way to get a larger share of the market.

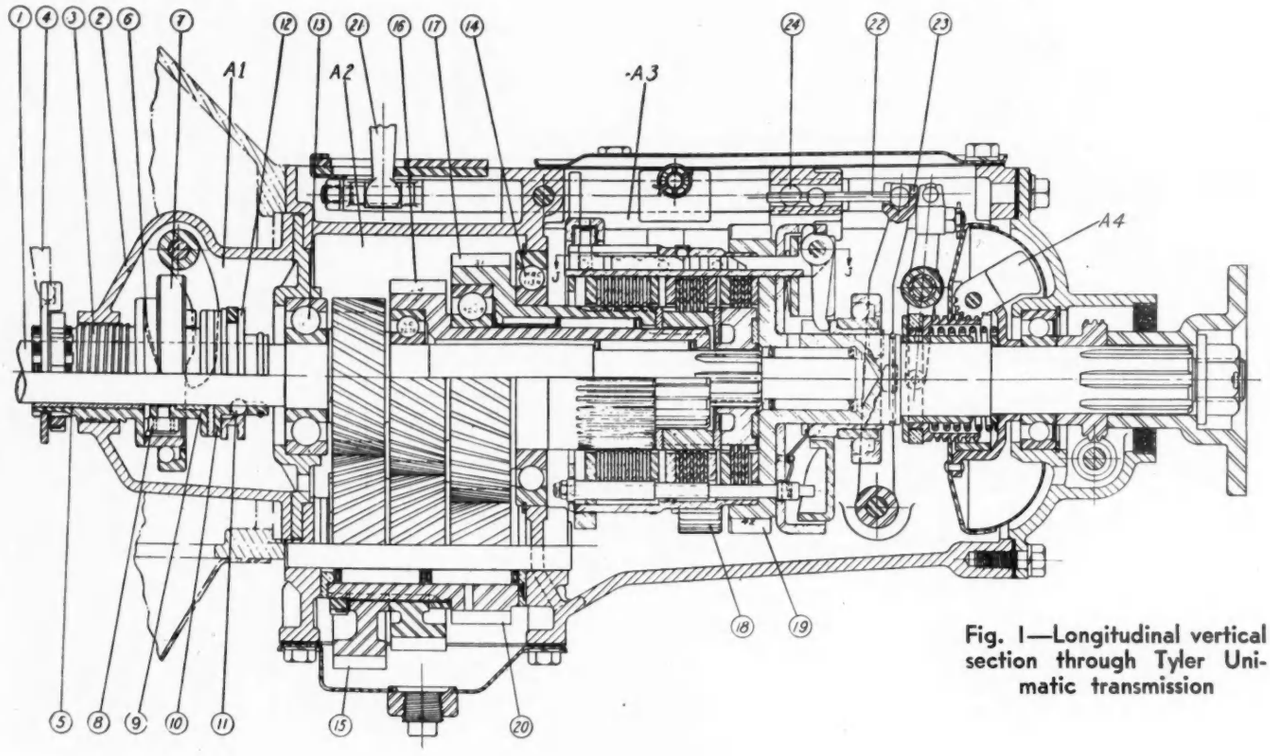


Fig. 1—Longitudinal vertical section through Tyler Unimatic transmission

Vacuum Operated Clutches

Speed shifts effected by release of accelerator pedal in Tyler Unimatic motor control

AN automatic-shift transmission which together with its control elements is known as the Tyler Unimatic motor-car control, has been developed in Detroit. It provides three forward speeds and one reverse. All gears for forward speeds are cut with helical teeth and remain in mesh continuously. This naturally involves that one of the gears of each combination be normally free on its shaft, and it can be made rigid with the shaft by means of a small, multiple-disc friction clutch. There are three such friction clutches, located close together and forming a single assembly. Engagement of these clutches is by springs, only one clutch being engaged at a time, of course.

The clutch springs act on a main pressure plate, from which the pressure is transmitted to one or another of the three auxiliary pressure plates associated with the three clutches and a selective ball lock mechanism. This selective ball lock mechanism connects one of the three sub-pressure plates to the pull rods, leaving the other sub-pressure plates disconnected therefrom. Provision is made also for a fourth, neutral position, in which none of the sub-pressure plates is connected to the pull rods.

Shifting of the selective mechanism is effected by a vacuum power unit which has two different compartments, one containing a piston for the operation of the main clutch, the other three, diaphragms for shifting the mechanism to the positions corresponding to the three forward speeds. Vacuum is admitted between the three diaphragms in succession by means of a slide valve which is actuated by a centrifugal governor on the main drive shaft of the transmission, which, of course, rotates at all times in direct proportion to the car speed. There is also a master vacuum valve, controlled by a button within the accelerator pedal or adjacent to it, which admits vacuum simultaneously to the main-clutch actuator compartment and the valve chamber for the shifting compartment.

Referring to Fig. 1, in compartment A1 of the transmission housing is located what is described as a synchronous detent for the main clutch. This assures that upon depressing the accelerator pedal the main clutch takes hold when the crankshaft catches up to the speed of clutch shaft 1 and not before.

The three pairs of helical gears are contained in the compartment A2. Of these, the main driving pinion is secured to shaft 1, while intermediate gear 16 and low-speed gear 17 are provided with hub extensions, each of which carries one set of discs of the multiple-disc

clutches, which latter are located in compartment A3. Reverse is effected by means of sliding gear 18 mounted on a short shaft which at its forward end carries a helical gear in mesh with low-speed pinion 20. Gear 18 can be shifted into mesh with gear 19 on the transmission clutch unit.

The transmission is provided with the usual shift lever 21, which through a sliding rod and ball link 22 also connects to the throw-out fork 23 of the transmission-clutch unit. Lock plungers 24 in conjunction with high points on the shifter rails lock out both the main clutch and the transmission clutch when the shift lever is moved into the neutral position.

The operation of the transmission will be explained with reference to Fig. 2. All three of the transmission clutches, 31, 32, and 33, form a unit, having the same driven member. These clutches are engaged by springs 34 acting against main pressure plate 35, from which the pressure is transmitted through triple channels 35 to one of three sub-pressure plates 37, 38, 39. In the channels 36 there are slidable selector fingers 40, and loosely placed in the side walls of the channels are three pairs of balls, 41. The selector fingers have narrow and wide portions, and when one of their wide portions is between any pair of balls, the latter project beyond the side walls of the channels, the projecting portion forming a lock between channels 36 and the side particular sub-pressure plate at that point.

Engagement and release of the transmission clutch, after selection, is effected by the same elements which control release and engagement of the main clutch, but the arrangement is such that the main clutch is always engaged and released first, so that the transmission clutch is never engaged under load.

Selector action is due to a centrifugal governor 42 whose motion is transferred to a valve-actuator 43 connected by pin 44 to sliding valve 45. This valve controls the ports 46 between the various diaphragms of the vacuum chamber. Vacuum thus admitted through the different ports acts on diaphragms 47, causing the rod 48 to move into any one of four definite stopping positions. These motions of rod 48 are transmitted to a conventional shifter rail 49, which thereby establishes the different gear positions, as well as the neutral position. Valve actuator 43 is so arranged that it snaps from one of its four positions to the next, instead of moving gradually throughout its range in accordance with the governor speed.

After valve 45 has been moved to any definite position by the governor, the actual change of gear does not take place until a main valve 52 opens the system to suction. This valve, as shown, is connected to the clutch pedal. Thus the shift occurs simultaneously with disengagement of the main clutch and the transmission clutch.

The entire system is controlled by the operator by means of the master control button located adjacent to or within the accelerator pedal but separate from the latter. Power actuation of the clutch and automatic shifting of gears are possible only when the master control button is fully retracted. The master control button projects slightly

Change Gears Automatically

by P. M. Heldt

Engineering Editor, Automotive Industries

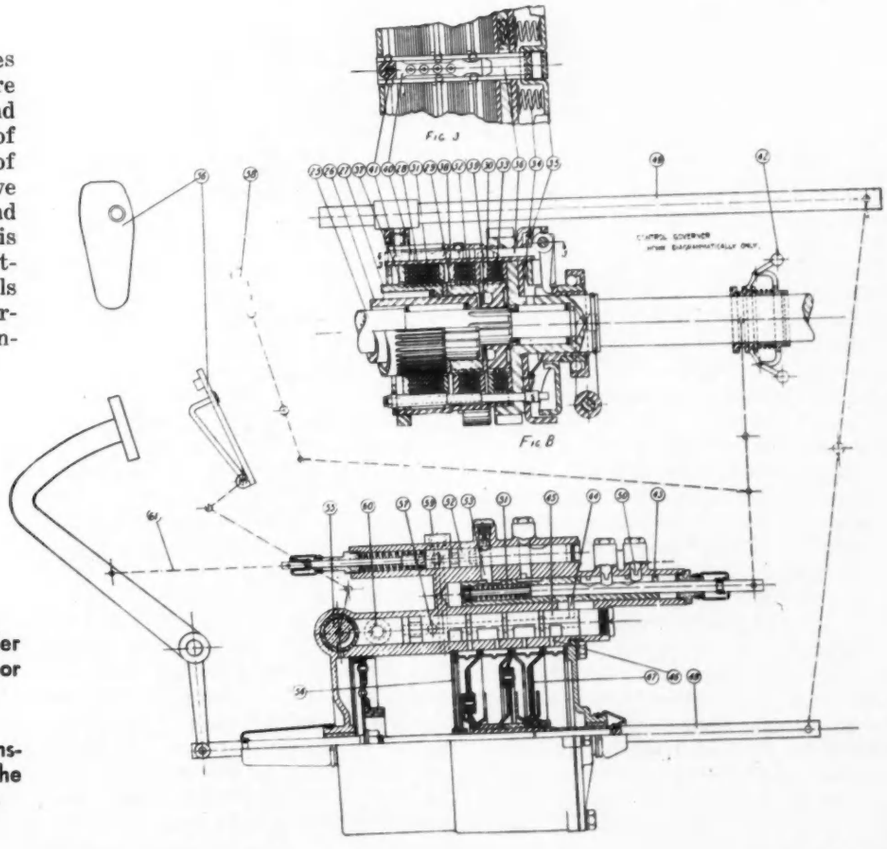


Fig. 2—Control elements of Tyler transmission represented more or less diagrammatically

The upper views show the transmission clutches and the lower the vacuum chambers and valves

above the accelerator pedal and by pressing it down to the level of the accelerator pedal with the latter in the idling or fully retracted position, the car is allowed to "free-wheel."

In Fig. 2, the shift lever is represented by 58, and its connection to the governor linkage is illustrated diagrammatically.

Operation of the transmission is as follows: Supposing the automatic feature to be effective, that is, the vacuum control button on the dash to be set in the "automatic" position, the transmission shifts into the low-gear position as soon as the engine is started, from whatever position it was in previously, the car does not start at once, however, for the high-vacuum in the inlet manifold of the throttled engine keeps the clutch disengaged. As the driver presses down on the accelerator pedal to speed up the engine, the inlet manifold vacuum decreases and first the transmission clutch and then the main clutch is engaged. The car is then accelerated in low gear, and while this takes place the selector mechanism moves to the second or intermediate-gear position. Shift to this gear takes place when the driver releases the accelerator pedal. The change to high gear is made in the same way. Reverse is obtained by means of a manual motion of the shift lever in the conventional way, and all speeds are obtained in this manner if the control button on the dash is moved into the "non-automatic" position.

Tax Exemptions Help Italian Industry; Fiat and Lancia Scheduled to Bring Out New Models Shortly

SALES of automobiles in Italy were greatly stimulated by the introduction on the market of the Fiat Ballila small car in July last, according to a report from U. S. vice-consul James W. Gantenbein at Milan and assistant trade commissioner John M. Kennedy at Rome. During the first half of the year the automobile business was in the doldrums, because incomes were decreasing as a result of the general business depression and prices of automobiles were not decreasing in proportion. One thing that helped sales of the Ballila is that the Government exempted it from the registration tax until June 30, 1933. Fiat is turning out 120 Ballilas per day, and there is considerable likelihood that in view of the stimulating effect it has had on Italian automobile business in general, the Government will prolong the period of exemption.

Lancia enjoyed the most prosperous year of all Italian motor manufacturers. It worked constantly at full capacity in its passenger-car department.

Sales of foreign cars in Italy cut little figure, for during the first eleven months of the past year only 551 cars and trucks were imported. During the same period Italy exported 5972 passenger cars, trucks and buses, as compared with 11,229 in the same period of 1931 and 19,993 in that of 1930. Although figures for the whole year were not yet in at the time the report was dispatched, it looked as though exports during the last half of the year would slightly exceed those of the first half, in spite of the erection of additional trade barriers.

As in other countries, there has been considerable competition in Italy between road vehicles and the railways, and the latter sponsored a proposed increase in the tax on motor fuel (fuel oil) amounting to 80 per cent. However, the Minister of War took the part of the motor vehicles. Italy, like other European countries, pays a subsidy on trucks suitable for military purposes, which are also exempt from annual taxes for a period of three years. An increase in the tax on fuel might have restricted the sale of trucks entitled to the subsidy and might also have made it more difficult for the army to dispose of its own trucks after their period of military usefulness had passed.

There is one important motor transportation company operating between northern and central Italy which has been offering strong competition to the railroads. It operates a fleet of motor trucks powered with Diesel engines (five Fiats, three O. M.'s and two Alfa-Romeos). It has a contract with the Pirelli tire firm of Milan for carrying the latter's products from the factory to distributing centers throughout Italy, and on the return journey it carries cork to a linoleum factory in the vicinity of Rome, and transports the product of this factory to distributing centers throughout the north.

Activities of the Fiat automobile department are largely confined to the Ballila at present, not more than 20 to 25 cars of other models being produced per month. The company, however, contemplates bringing out a new model during the Spring, which will probably be shown at the Milan fair. It is to sell at around $850 and is intended for those who consider the Ballila a little too small and yet are not prepared to pay the price of the two larger Fiat models ($1350-$1550).

Lancia also is expected to bring out a new small car, to be known either as the Vespia (Wasp) or the Milambda, and to retail at about $975. The Lancia, the report states, enjoys a splendid reputation in Italy as a quality product.

Of the remaining automobile manufacturing firms in Italy only Bianchi is expected to continue to do even a fair amount of business. It has produced a four-cylinder model for four years and an eight since the beginning of 1932. Neither model has been changed perceptibly since its inception, and no changes are contemplated for the present. O.M. is engaged mainly in the production of trucks, Italo and Ansaldo for the present are confining themselves to assembling old parts, and Isotta-Fraschini is said to have practically ceased manufacturing operations.

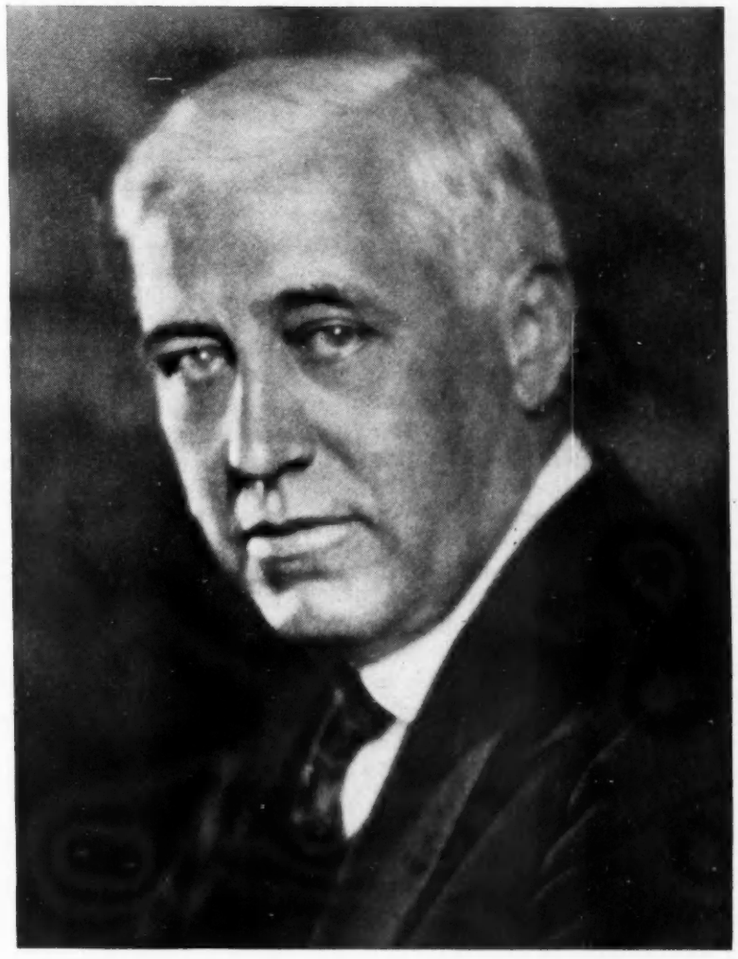
It is believed in Italy that during 1933 Fiat will probably manufacture 100 trucks a month, O.M. about 60 and Alfa Romeo about 30. All of the O.M. and Alfa Romeo trucks are equipped with Diesel engines, and so are the heavy trucks of Fiat. Bianchi made about 100 light trucks during the past year and is expected to continue at the same rate this year.

Motor buses are made in Italy by Fiat, Lancia and Alfa-Romeo, the first two being by far the most important producers. The total number of buses produced in Italy last year is not believed to have exceeded 800. Bodies for these buses are furnished for the most part by the Carrozzeria Balbo in Turin.

According to Italian official statistics, 1044 motorcycles were imported during the first 11 months of 1932, of which 851 came from Great Britain, 69 from the United States, 68 from Germany, 43 from Belgium and 10 from France. Since the Italian production of motorcycles is in the neighborhood of 10,000, foreign motorcycles offer a certain amount of competition, particularly in the class of large machines.

A. C. Pearson Dies

Was Chairman of the Board of the United Publishers Corp. and President of the National Publishers Association



A. C. Pearson

ANDREW CAMERON PEARSON, chairman of the board of the United Publishers Corporation, New York, died at his home in Montclair, N. J., early in the morning of March 31, aged sixty years. He was one of the country's outstanding publishers of business magazines and served as president of the Associated Business Papers, Inc., during the year 1918-1919.

Mr. Pearson was born in Coffeyville, Kan., November 17, 1873, the son of Samuel Martin and Ella Anne (Cameron) Pearson. He was educated at Baker University, Baldwin, Kan., from which he graduated in 1895, and which made him an honorary M.A. in 1920, and at Northwestern University, Evanston, Ill., from which in 1896 he received the degree of LL.B.

Starting his business career as an insurance claim adjuster, Mr. Pearson became manager of the Pearson Bros. Department Store in Osawatomie, Kans., where he received the training in merchandising which served him so well when, in 1898, he joined the advertising staff of the *Dry Goods Reporter* in Chicago. From that paper he transferred to the *Dry Goods Economist* in New York in 1904. He was successively advertising manager, vice-president and general manager, and in 1924 became president of the Economist Group Publications.

In 1913 he was made secretary of the United Publishers Corporation, filling successively the offices of treasurer, vice-president and, since 1926, chairman of the board of that company, whose publications include *Dry Goods Economist, Iron Age, Hardware Age, Boot & Shoe Recorder, Jewelers' Circular, Distribution and Warehousing, Optical Journal,* all of New York; *Automotive Industries, Automobile Trade Journal, Commercial Car Journal* and *The Spectator,* of Philadelphia; and many catalogs and trade directories. He was also vice-president of the Newton Falls Paper Company.

Mr. Pearson was a trustee of Baker University, president of the National Publishers Association, national chairman of the American Publishers Conference, director of the Merchants Association (New York) and a director of the Chamber of Commerce of the United States, 1922-24. He was a Mason and a member of the Engineers, Advertising (New York), Racquet (Washington, D. C.), and Upper Montclair Clubs. In 1931 Mr. Pearson was made a Chevalier of the Legion of Honor for services to the French Government.

Surviving are Lelia Campbell Pearson, whom he married in 1897, and five children—Josephine Rae (Mrs. Theodore Hughes Arnold), Dorothy Louise, Andrew Cameron, Forrest C., and John R. Funeral services were held at home, Sunday, April 2.

JUST AMONG OURSELVES

Automobile Life is Real

LIFE in the automobile business may not be as pleasant today as it was back in 1921, but it's a lot more interesting. Back in those days the things that *really* interested a lot of executives and engineers weren't actually in the automobile business at all. Their automotive activities, for a great many, merely provided the wherewithal to permit development of other interests.

Today the business itself is vitally interesting—of necessity, perhaps, in many cases—but vitally interesting none the less. And the automobile business in the future will profit because a majority, having found out how intriguing, complex automotive problems can be, probably will retain that interest permanently, good times or bad. At least the present times are providing more material for telling to future grandchildren in the "I-remember-when" manner than any similar period since the war.

Masury's Last Flight

IN the frightful disaster which befell the dirigible Akron, the automotive industry in general and the truck field in particular lost one of its strongest men and one of its most robust personalities. A. F. Masury, vice-president and chief engineer of Mack, long interested in lighter-than-air development, was among its ill-fated passengers. He had been a passenger also on the Graf Zeppelin in May, 1929, when that finally-successful ship was forced to turn back without crossing the Atlantic.

He was a Colonel in the Ordnance Reserve Corps of the U. S. Army and played an important part in coordinating relationships between technical phases of the automotive industry and the work of the ordnance department as chairman of the Ordnance Advisory Committee of the S.A.E.

Characteristically, he took a prominent part in the fight about "assembled" and "manufactured" trucks in New York last year. Wherever there was need for courage, for service, for constructive and forceful action, he was called on frequently—and he always answered effectively.

The entire industry suffers in his passing.

* * *

34 Point Stimulant

WE'LL guarantee you an interesting hour or two with a book called "The Voice of Young America," if you aren't one of those who think George III still rules Britannia, and consequently dismiss the author as an Anglophile.

James H. R. Cromwell, whom we have never had the pleasure of meeting personally, is a vice-president of the Peerless Motor Car Co. and the author of this little book. It is directed primarily to "those of us who are between 18 and 45," because, Mr. Cromwell thinks, we are going to "bear the brunt of future calamities." The volume is designed to move us "to a fuller comprehension of the evils and errors which menace our country's safety."

Having passed successfully the red, white and blue wrapper of the volume, we found ourselves in hearty agreement with Mr. Cromwell as early as page 8, where he says: "'The good old days' are gone forever and we face a new economic order which demands less individual selfishness than heretofore obtained and more collective efficiency."

* * *

Our Graven Image

MR. CROMWELL urges that we stop "worshipping at the feet of our graven image, the Constitution, because it is a false god and has encompassed our ruin." He would have us go to a parliamentary system of government, somewhat similar to that of Great Britain. Then he analyzes briefly and briskly the various elements of our economic and political structure, giving 34 needed reforms, some of which you will agree with and some of which you won't. We think it's a good book, because we agree with most of them.

If we could find any real excuse for doing so, we'd like to write several pages on the book. Unable to find the excuse, we will mention the Sixteenth Reform, because pertinent to current automotive affairs.

Reform 16 "is to compel plaintiffs to file their bills of complaint privately with a judge, who, after considering the same, may instruct the plaintiff to produce a bond sufficient in the judge's opinion to compensate the defendant for his actual legal expenses and loss of time in the event the court's decision is in his favor."

You say you can see plenty of arguments against that? So can we.

Well, that's why the little volume will be stimulating to most automotive men.—N. G. S.

RICARDO HAS NEW THEORY

to Explain Concentrated Wear of Cylinder Bore

Believes Corrosive Action of Unburnt Portions of Mixture May Be More Important Than Abrasion . . . . . .

Harry C. Ricardo

THE corrosive action of the products of partial combustion may be the cause of concentrated wear at the top of the cylinder barrel, Harry Ricardo told a recent engineering meeting in England. He also discussed cracking of the babbitt linings of high-speed Diesel connecting rod bearings and said that, as a remedy, he favored the use of a built-up crankshaft with floating bearings.

As regards wear of cylinder liners, Mr. Ricardo found that the average rate of wear at the top end of the stroke of the top piston ring is from 0.003 to 0.004 in. per thousand hours of running in the case of gasoline engines, and about 75 per cent greater in the case of high-speed Diesel engines. The rate of wear appears to be independent of the speed of revolution, the distribution of wear over the length of the cylinder seems to be always the same; the material of the piston appears to have no influence, but in the case of Diesel engines the choice of fuel has an important bearing on the rate of wear. In sleeve-valve engines the wear is of an entirely different order and little more than one-tenth as rapid as with stationary liners, and the wear appears to be independent of the rate of oil consumption.

It is generally assumed that liner wear is a matter of abrasion, but one thing against this theory is that in that case the wear on the liner and the ring should be the same, while as a matter of fact the loss of material from the liner is usually many times greater than the loss from the rings. Furthermore, when materials which by reason of their extreme hardness are known to resist abrasion, such as case-hardened or nitrogen-hardened steel are used for cylinder liners, we find to our surprise that the rate of wear is usually very considerably greater than that of cast iron.

The above evidence has led Mr. Ricardo to believe that the greater part of the loss of metal from the cylinder liner is to be accounted for by direct corrosion by products of partial combustion. In a heavy oil engine, when the flame is chilled suddenly by contract with any relatively cold surface, the process of combustion is pulled up short and partial products, some of them strong oxidizing agents, are let loose. As the piston approaches the top dead center, the protecting oil film between the rings and the liner begins to break down, and at the same time the pressure behind the ring to rise. At top dead center the ring is stationary for an instant, and the pressure behind it is rising rapidly. What little oil remains is squeezed out until no more than a layer of molecular thickness is left, and the surface of the liner at that point has been squeezed until it is practically dry.

As the piston begins to descend the pressure behind the ring is still building up, and some appreciable distance is traveled before the velocity is such that the ring will again be lifted and ride on a fluid film. Now, as the piston descends farther, there is left to the flame a band of the liner of indeterminate depth from which the oil film has been wiped almost clean, and which is therefore largely unprotected from direct attack by the products of partial combustion. The corrosion products of combustion attack the metal immediately.

In support of the above theory Mr. Ricardo cites the following observation, among others: Some years ago the cylinder of a large experimental gasoline engine blew clean off during a test. Within less than 30 seconds after the engine had been running normally, a band of rust had appeared at a level corresponding with the position of the top ring at the top of its travel. The remainder of the bore above and below was well lubricated.

The author states that opportunities for such an observation are rare, for, in the course of events an engine cannot be stopped in full swing or before it has turned a few revolutions without combustion taking place, and this has removed all evidence.

If the theory outlined in the foregoing is correct, it is, of course, important to so arrange the combustion chamber that the flame is not likely to strike a relatively cool metal surface, thereby giving rise to the production of corrosive intermediary products of combustion.

Referring to rod bearing failures, from fuel consumption records it has been calculated that the average torque factor of a commercial vehicle engine is about 33 per cent during its running hours. By plotting pressure-time diagrams of gasoline and Diesel engines for the condition of one-third full torque, the great difference in the pressure conditions is shown. The maximum pressure in the Comet Diesel engine under this condition is about three times that in a gasoline engine, and the ratio of pressures is even much greater when idling.

Mr. Ricardo states that roughly about 60 per cent of the manufacturers of high-speed Diesel engines are suffering from big-end bearing troubles in the form of cracking of the white-metal linings. While of the engines turned out by the 60 per cent, 80 per cent will develop cracks within a certain period, of those turned out by the other 40 per cent, less than 10 per cent will show cracks within this period.

The progress of events is usually very much the same. After a certain period of service, small cracks appear in the white-metal lining of the top half of the connecting rod bearing, right in the center and immediately under the shank of the rod, these cracks spread gradually and multiply until the whole surface becomes a mosaic.

Engines may be divided into five classes according to the arrangement of the combustion chamber, but the rod-bearing trouble seems to be prevalent more or less with engines of all classes. There are only slight differences with respect to connecting-rod and bearing proportions, and engine speeds are usually governed and the drivers drive as fast as their governors will permit, hence these factors furnish no clue to the cause of the trouble.

Where design and cost considerations permit of the use of a hardened crankshaft, a harder bearing material, such as lead bronze, gun metal or duralumin, may be used, and with these the difficulties mentioned do not arise. But with any of these harder bearing metals the danger of seizure in the event of lubrication failure is much greater than with white metal, and such seizure often entails destruction of the crankshaft and much supplementary damage. Mr. Ricardo says that wherever possible he prefers the use of a built-up crankshaft with floating bearings; for in a floating bearing white metal can be used without risk of cracking, since the bearing is turning constantly and does not always receive the blow on the same sore spot. Where white metal is used it is best to use very thin linings, 0.010-0.020 in. thick, on thin steel shells.

Since the load on the connecting rod bearing is not the same as the gaseous pressure on the piston, but is modified by the inertia of the piston and the elasticity of the connecting rod, a heavy piston and a connecting-rod material having a low modulus of elasticity would seem to offer advantages, and Mr. Ricardo said he had used cast iron pistons and light-alloy pistons with success so far as immunity from cracking of big-end bearings was concerned, but not sufficiently long and in sufficient numbers to draw any definite conclusions.

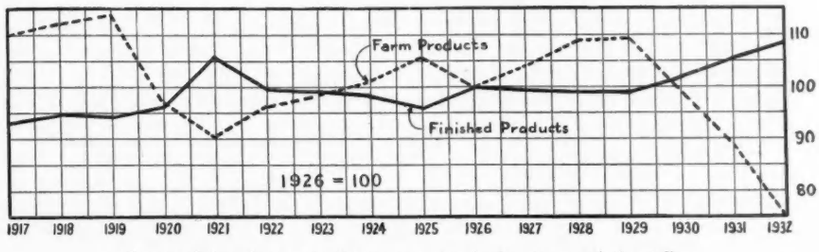
Industry's Stake in Farm Relief

Farm prices have gone down so much faster during the depression than prices on finished goods, that prices on the latter measured in terms of farm purchasing power have actually increased. The correction of this disparity between prices for farm and finished products (of which the automobile is an example) is the object of the agricultural relief bill which President Roosevelt had introduced into Congress.

Even now prices on many classes of finished goods are at unprofitable levels and industry knows that to attempt to restore farm purchasing power by further reductions in the prices of finished goods would be to court disaster. Consequently, industry has more than a sympathetic interest in efforts to lift agricultural prices to the point that the farmer will resume his normal position as a customer for manufactured products.

The problem is admittedly a difficult one inasmuch as it involves making farming more profitable and at the same time curtailing farm production. The conflict is obvious, as profits are the strongest incentive to increased production. The President frankly admits that he does not know whether the proposed legislation will turn the trick. Certainly it vests vast powers in the executive branch of the government as it can through its efforts to control prices, determine largely what we eat and how much

Despite these difficulties, industry hopes that the President's proposal or some other factor will operate to lift agricultural prices, because industry certainly needs its farmer-customers.



Corrected for changes in the average purchasing power of the dollar.

French Engineers Frown on the "Frowners"

TAKE ISSUE with Claveau's Views on Rear Engines and Front Drive

ADVOCATE Independent Wheel Springing

ANDREAU DISCUSSES Body Aerodynamics

French Engineers

Frown on Rear Mounted Engines

Pioneer in This Type of Construction Says Complexity of Controls Alone Is Enough to Bar It

A REAR mounted engine is not the best solution of the problem of the general layout for passenger car chassis, according to conclusions reached by Emile Claveau in a paper presented recently before the French Society of Automotive Engineers. M. Claveau was one of the earliest advocates of the rear-mounted powerplant and has had considerable practical experience with the design and construction of cars of this type.

The disadvantages of the rear-engined car, which M. Claveau considers more important than its advantages are outlined by him as follows:

Automotive Industries, February 18, 1933

SINCE we published in these columns some extracts from a paper by M. Emile Claveau, read before the French Society of Automobile Engineers, in which he gave his reasons for abandoning rear-mounting of the power plant, it seems apropos to also give here the views of some of those who took issue with him, or who supported him, in the discussion of his paper, to which a special session of the society was devoted.

M. Bethenod said he could not quite agree with the author as regards the superiority of front-wheel drive. No doubt, a front-wheel drive chassis, if well worked out, might give excellent service. That such a chassis permitted taking turns at quite high speeds, permitted reducing the floor height to a minimum, and rid that portion of the chassis reserved for the body of all parts having to do with the propulsion of the vehicle, was quite evident, but these advantages were accompanied by some disadvantages.

The need for a transmission with transverse propeller shafts, so arranged as to permit of deflection of the front wheels, involved certain difficulties, especially in the case of a light car with narrow tread. Moreover, the universal joints might be subjected to abnormal wear, due to excessive loads imposed on certain parts when making sharp turns under power, as shown by M. Causan in the *Journal de la S.I.A.* for May, 1930. Too often it had been believed that it sufficed to use a Hooke's joint for a correct solution of the problem of transmission to front wheels, and all those interested in the subject were advised to study the paper referred to. Finally, it was likely, at least in the case of a commercial vehicle where the load varies within wide limits, that the adherence of the front driving wheels occasionally would leave something to be desired, and the abnormal tire wear observed on various occasions seemed completely to justify this fear.

M. Bethenod said that in his opinion, if it was desired to get out a light car with the chassis and body in the form of a shell, it would be quite rational to adopt the arrangement used on the famous De Dion-Bouton voiturette of 1899. In this light car the single-cylinder 3½ hp. engine was located at the rear, on the left side, and its crankshaft, which was parallel with the axle, was extended on the right to form the primary shaft of a two-speed transmission of the constant-mesh type, the secondary shaft of which, through a spur pinion, drove the crown gear on the differential. There was a friction clutch for each of the two speeds, and the rear wheels were driven through transverse propeller shafts. It would be easy to rejuvenate that arrangement, as shown diagrammatically in Fig. 1.

The engine today would be a small four-cylinder, of perhaps 60 cu. in. displacement, which would be more easily accommodated than the single-cylinder of 1899 with its enclosed flywheels. It would drive through a friction clutch (not shown in the diagram for the sake of simplicity) the primary shaft 2 of a four-speed transmission, the helical pinions, 3 of which remain constantly in mesh with the helical gears 4 of the secondary shaft 5, the different speeds being engaged by positive clutches in the

well-known manner. The secondary shaft drives the differential 7 through a spur pinion 6, and transmission by transverse jointed shafts is retained, making independent wheel springing possible. Alternately it would be possible to provide two gear reductions in the differential housing so as to obtain four changes of speed with a two-speed transmission. In any case, with an arrangement of this character, and with the advances which have been made in gear cutting (all gears used being of the spur type), it would certainly be possible to obtain a very silent drive, and the efficiency of transmission would be the same in all speeds and quite high. The radiator could be located at 8, and a wind tunnel and louvers could be arranged to provide a good air circulation.

M. Bethenod said he was convinced a vehicle of this type would give excellent service, with a total weight which probably would be a minimum for a certain useful space available. From this point of view, the criticism directed against rear mounting by M. Claveau appeared rather too severe to him. The space vacated at the front could be used in part for the feet of the driver and front-seat passenger and in part for baggage.

For the rapid transportation of tourists under optimum conditions of comfort and safety M. Bethenod said he and M. Causan had jointly sketched such a vehicle in 1926. The combined frame and body was to have two side rails, arranged parallel with each other, of such height that the roof could be supported by them directly. The longitudinal profile of these rails was to be that of a thick airplane-wing section, and the following general arrangements were contemplated:

The engine was to be located at the rear, immediately back of the radiator, which was to receive air through a longitudinal channel underneath the floor, the air being discharged through louvers in the sides of the body at the rear. Entrance to the body was through an opening in front, a movable cover pivoting on horizontal hinges facilitating ingress and egress. All four wheels were to be driven, but the front wheels could be unclutched independently of the rear wheels. The object in driving all four wheels was to permit of an acceleration equivalent to the reverse of "jamming on the brakes." Independent unclutching of the front wheels would make it possible to drive through the rear wheels alone.

This, the speaker said, brought up the captivating question of four-wheel drive for high-speed vehicles. While four-wheel drive tractors were used during the war and even before, the problem of four-wheel drive for passenger cars did not seem to have been dealt with exhaustively as yet, and M. Bethenod expressed the hope that M. Bugatti would shortly make available the results of his experience along this line.

He concluded his discussion by voicing the hope that he would some day ride around in a car corresponding to the foregoing description: it would be a sort of bobsleigh with the appearance of an enormous turtle, the shell of which would efficiently protect the passengers in case of an upset and which would offer very little air resistance, even in a side wind.

M. Lienhard Discusses Design

M. Lienhard said he wished to discuss three questions, viz., where the engine should be located, how the wheels should be attached to the chassis, and how the body should be built.

Referring to the sketch of M. Bethenod, he said it would be observed that the frame was narrowed in front, to permit of a shorter turning radius, and this narrowing of the front part of the frame was required regardless of the location of the engine. In this case the engine was placed at the rear, but if it had been placed in front considerable additional room for the passengers could have been gained. Therefore, considering the space necessarily available between the front wheels, it was possible to place the engine there and to assure just as much comfort for the passengers as with any other arrangement.

As regards suspensions, M. Lienhard said he was absolutely convinced that the front wheels should be independently sprung. All those who had had experience with cars having the front wheels independently sprung were convinced that the riding qualities of the vehicle were improved in no uncertain way.

With respect to independent springing of rear wheels, M. Lienhard said he agreed with a previous speaker that this had the disadvantage of causing side sway at turns. He had himself been responsible for cars with independent suspension at all four wheels. These vehicles held the road well when fitted with open bodies. If a somewhat more weighty style of body was placed on the chassis, one had the impression at turns that the car was moving sideways, which gave a very disagreeable feeling of instability. Experiments were continued and it was found that by making the rear more rigid, this disadvantage disappeared. Possibly the vehicle was not so well sprung on poor roads, on straightaways, but when turning corners the stability was noticeably improved.

In Germany there once was a vehicle which had its hour of celebrity—the Rumpler. This car was to have all of the desirable features, and particularly afford additional room for the passengers, but it fell far short of its promises, and it finished up miserably as a taxicab in the streets of Berlin. The engine, which was to be noiseless, or at least was not to annoy the passengers by its vibration, was so frightfully noisy that it was almost impossible to ride in the car with any degree of comfort. This, M. Lienhard said, was almost the only tangible result obtained with cars having the engine at the rear, so far as he was aware.

The Germans are also very fond of aerodynamic forms. They created the so-called Tropfenwagen (translated voiture styligoutte into French—tear-drop car into English). At the 1928 show there was a veritable flood of such aerodynamic cars. All of them approached the form of an egg cut in half through its longitudinal axis and placed on the ground. All of these vehicles disappeared again as quickly as they arrived upon the scene.

M. Lienhard said he believed it was impossible to produce a vehicle of this form without making too great sacrifices, not only in the matter of appearance, but also in regard to passenger comfort. "Consider what is taking place in the field of aircraft. With these it is very much more important that the air resistance be cut to a minimum. Now, in all modern aircraft you have the form of a solid of least air resistance and, generally, a projection on top so arranged that the pilot and mechanic may have sufficient vision. Even with these precautions it is often very difficult to see the ground ahead when making a landing.

"Therefore, if you produce a 'styliform' body you are faced with one difficulty, that of having

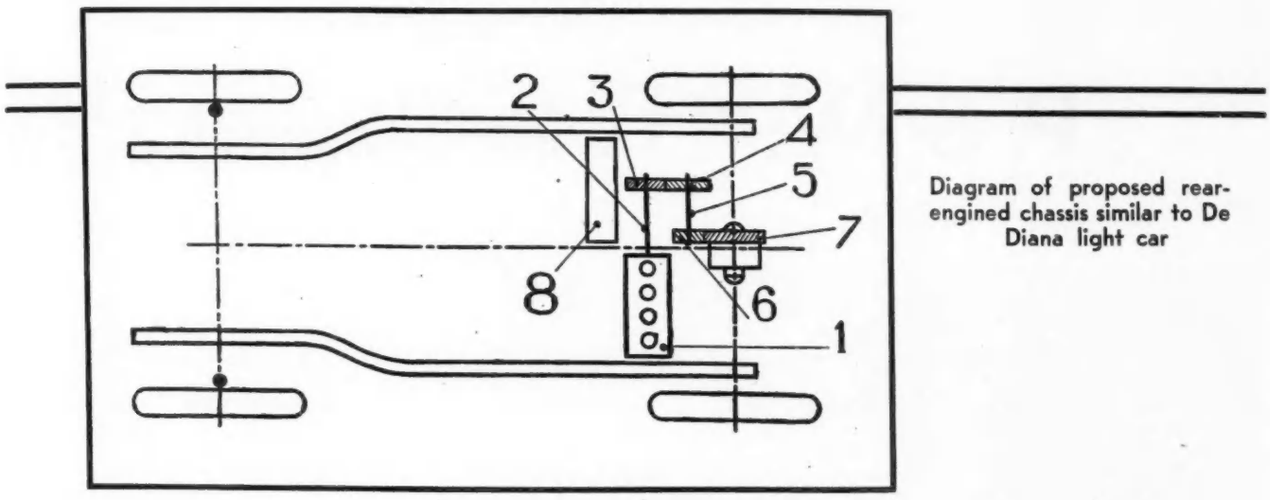


Diagram of proposed rear-engined chassis similar to De Diana light car

insufficient vision ahead. You will be forced to redesign the structure and in the end, while your car probably will be more drawn out at the rear, still it will approach the present-day conventional form."

M. Andreau, who is in charge of the aerodynamic laboratory of the Chausson Radiator Co., pointed out, among other things, that aerodynamic effects have a considerable influence on the stability of a car. It was shown long ago that the components of the force of the wind on a moving body vary with the direction of the wind relative to the axis of symmetry of the body in such a way that they produce couples resulting in instability, which are proportional to the square of the relative velocity of the wind.

The effect of an oblique relative wind (the case of a vehicle traveling in a side wind) is thus to both increase the resistance to motion and to introduce a moment which tends to deflect the vehicle from its course. The enveloping curve of the resulting forces is known as the metacentric envelope. This has a point or plane of reversal on the axis of the movable body. It is found that the metacenter moves forward as the resistance to motion of the body decreases, that is to say, as it penetrates the air more readily. If the metacenter is forward of the center of gravity, the equilibrium in the direction of the axis is unstable.

It may be shown experimentally that for small, fast and light cars, traveling at about 125 m.p.h., the moment of the air resistance becomes superior to the moment of the ground adherence for a relatively small angle. This results in loss of steering control at turns, particularly if for any reason the coefficient of ground adherence diminishes, as it often does on wet roads.

The need for stabilization made itself plainly felt in attempts on the world's speed record, and led to the study of the aerodynamics of Campbell's car, for instance, and the addition of tail surfaces at the rear so as to bring the metacenter back of the center of gravity.

In a study of air circulation around a vehicle, good use can be made of two small models, one of them being hollow, air-tight, and connected to a manometer. On the principal lines of the body there is arranged a series of small plugs.

If one of these plugs is removed, the manometer shows the static pressure of the air at that particular point. This method is very useful in studying the variation of speed, pressure and under-pressure around the body being investigated. In the case of a vehicle, it permits of studying the possibilities of the best utilization of the natural air flow between zones of pressure and zones of under-pressure, as for the ventilation of the radiator, the engine, and the interior of the car. Diagrams of this type have been worked out and proven very instructive.

Utilizing Natural Air Flow in New Designs

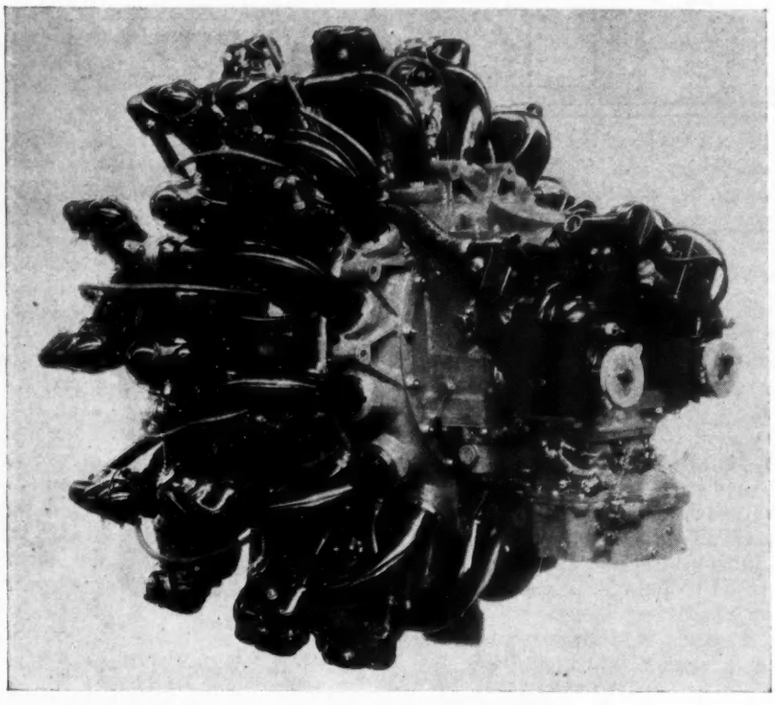
It is thus found that on vehicles of conventional form the only parts at which there is an overpressure of the air are the radiator, the windshield, the dashboard and the footboard. At all other parts there is an under-pressure, except the floor, below which the pressure is practically equal to atmosphere, which indicates that below it and in contact with it the air is being dragged along at vehicle speed.

The result is that at the door frames especially, which never fit absolutely tight, air flows from inside of the body outward, and the vacuum thus created is filled with air from in front of the dash, where it is under pressure, with the unpleasant results of an increase in temperature inside the body and the entrance of fumes from under the hood.

M. Andreau said that aside from furnishing the information outlined in the foregoing, the aerodynamic shadowgraph is of interest also because it permits of determining the frictional part of the air resistance, and by a study of same, to improve the form of the vehicle as a whole.

The greatest interest attaches to a reduction of the air resistance. At present the maximum power of the engines is being limited more and more, partly by tax regulations. It is not possible either to pare down weights much more. As regards reduction of air resistance, practically everything remains to be done, so far as practical results are concerned. This work should be done in close cooperation with body designers, whose artistic sense and professional skill may make it possible to offer to customers forms that not only give the impression of reduced air resistance, but actually have it. It is certain that such collaboration would result in a new esthetics which would be, as in the case of the airplane, an adaptation to the medium, which is in reality the greatest satisfaction to be found in the appearance of any object.

P. & W. "Twins" Exceed Power



Three-quarter front view of Twin Wasp Junior

OFFICIAL tests were completed recently of two sizes of 14-cylinder, two-row, geared and supercharged air-cooled aircraft engines which were developed by the Pratt & Whitney Aircraft Company, East Hartford, Conn., in collaboration with the Bureau of Aeronautics of the Navy and the Air Corps of the U. S. Army.

One of these engines, the Twin Wasp Junior, has a displacement of 1535 cu. in. and is officially rated at 700 hp. at 2500 r.p.m., this output being maintained up to an altitude of 8000 ft. by supercharging. The actual average power developed by the engine during the test is said to have been 725 hp. at the rated speed, and the average fuel and oil consumptions were 0.55 and 0.019 lb. per horsepower per hour, respectively. Changes in the induction system designed to improve the charge distribution resulted in very low fuel consumption figures being obtained, as low as 0.44 lb. per hp.-hr. in the cruising range, and the manufacturers express the view that the fuel consumption while cruising should not exceed 0.46 lb. per hp.-hr. The weight of the engine is 975 lb. or 1.34 lb. per hp.; its overall diameter is 43⅞ in., and the gear reduction, 3:2.

The larger engine, the Twin Wasp, has a displacement of 1830 cu. in., and is rated at 830 hp. at 2400 r.p.m., which output is maintained up to 4500 ft. altitude by supercharging. During its 100-hour test it developed an average of 830 hp., we are informed. The average fuel consumption during the test was 0.55 lb. per horsepower per hour, and the oil consumption, 0.027 lb. per hp.-hr. The same as the smaller model, the engine is very economical of fuel especially in the cruising range. Its weight is 1125 lb., making the specific weight, 1.36 lb. per hp. The reduction-gear ratio is 3:2 and the diameter of the engine is 47⅞ in. This is said to be the most powerful air-cooled aircraft engine at present in production in this country. Approved certificate No. 95 has been awarded to the Twin Wasp Junior and No. 96 to the Twin Wasp.

Both engines are furnished with shrouds which were designed to give good cylinder cooling and a minimum drag when used with high-speed cowling. Inasmuch as both engines are of similar design, a description of one will serve for both.

The main crankcase, of aluminum alloy, is made in three sections, being split in the center plane of each circle of cylinders. The two-throw crankshaft is carried on three anti-friction bearings, one in each section of the case. Each crankpin carries a master connecting rod and six link rods. Each master rod is fitted with steel-backed, lead-bronze bearings. The link rods are connected to the master rod in the conventional manner and lubricated under pressure at their inner ends. All rods are of I-section and finished and polished all over, which gives the opportunity for inspecting all surfaces. All rods are chrome-nickel-steel forgings. Pistons are of the forged, ribbed type and provided with three compression rings and one scraper ring each. Piston pins float.

The front and rear crankcase sections are provided with extensions which directly support the cams and valve tappets. The cams are driven by spur gears directly from the crankshaft, the gears being supported by bearings on both sides. The valve tappets are carried in the same member as the cams, to assure their proper adjustment and alignment. This construction also makes it possible to assemble the entire power section and time the valves while the cams and tappets are still exposed to view, and it also makes for rapid assembly in times of necessity, as the three major portions of the engine can be built up independently and the whole assembly then completed. Tappets can be removed without disturbing the tappet guides.

The cylinders are of composite construction, the barrels being machined from steel forgings, with closely-spaced cooling fins, while the heads are castings of aluminum alloy which are screwed and shrunk

Ratings In Official Tests

New Double Row Radials Develop 725 and 830 Hp.—Average Fuel Consumption 0.55 Lb. per B.H.P. Hr.

onto the barrels. The rocker boxes are cast integral with the heads. The exhaust ports were specially designed with a view to maximum cooling and ease of connection of the exhaust manifolds. On both the head and the barrel the fins are spaced much more closely than is customary, to obtain a maximum radiating surface. Exhaust valves are of the internally cooled type. Valve seats of aluminum bronze are shrunk into the heads. The valve rockers are mounted in large antifriction bearings.

Adjusting screws are of the regular Pratt & Whitney design but much stronger than those used on the single-row engines in the past. The pushrods are short and made of heat-treated aluminum-alloy tubing fitted with hard-steel ball ends. All parts of the valve gearing are completely enclosed, and provision is made for lubricating both ends of the pushrods and rocker arms, as well as the rocker bearings, through drilled internal passages.

The rear assembly consists of two major castings, viz., the blower section which comprises the blower ring with its 14 separate outlets to the cylinders, and the supercharger diffuser section with the carburetor inlet elbow. This latter section forms the support for all of the accessories. On it are mounted an Eclipse starter, a Stromberg double-barrel carburetor, two 14-cylinder scintilla magnetos, oil pumps, oil strainer, fuel pump, two gun-synchronizer drives, two tachometer drives, and the generator drive. Provision is also made for mounting and driving a vacuum pump, to provide the suction necessary for certain flight instruments, and also for a pressure unit for the operation of other devices, including "ice overshoes."

The rear-section assembly is similar in design to the rear end of single-row engines and has built into it a General Electric centrifugal supercharger. A clutch in the supercharger drive train reduces the stresses on the gears. Eight engine mounting supports are provided on the blower section, being combined with the blower outlets. Inlet pipes with flexible joints connect the blower outlets to the individual cylinders. There are two spark plugs in each cylinder head, in a fore-and-aft plane, and all ignition wiring is covered by a Breeze shield.

The nose section of the crankcase encloses a spur planetary type of reduction gear which is so designed that all teeth can be ground. A bell gear is spined to the forward end of the crankshaft, its hub being supported by a roller bearing carried in an aluminum diaphragm mounted on the front of the crankcase. Six planetary pinions mesh with both the bell gear and the stationary sun gear carried in the nose section of the crankcase. The planetary pinions are supported by a forged-steel cage which is splined to the propeller shaft. A patented feature is designed to equalize the load between the different pinions. The

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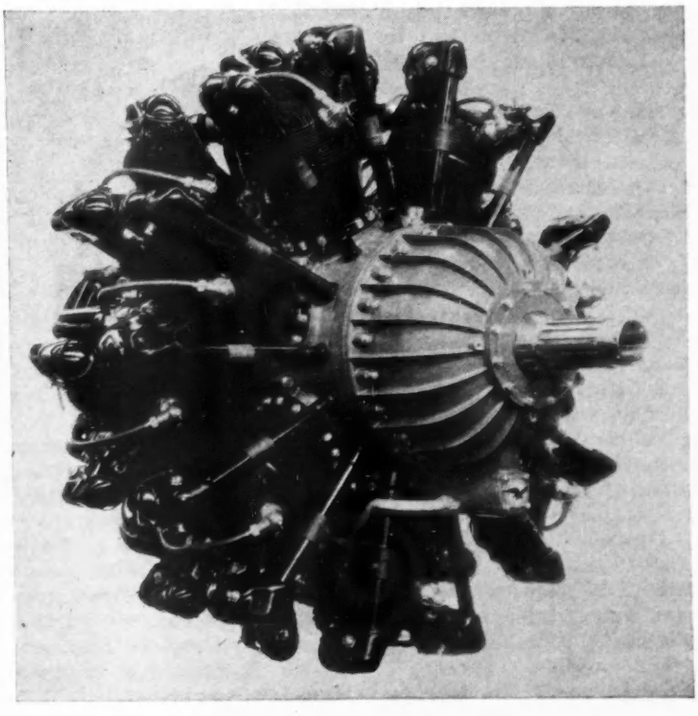
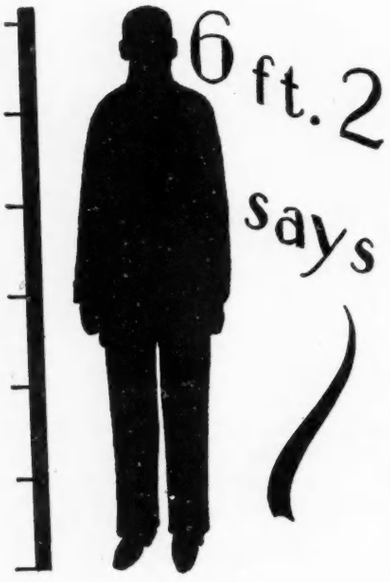


Three-quarter rear view of Twin Wasp Junior

Three Jeers at Some Recent



While the three critics of current body design trends whose opinions are presented here, in size are representative of the whole range of adult height, it doesn't follow, of course, that their views are necessarily typical of general public reaction.

In presenting their viewpoint under a somewhat facetious headline, Automotive Industries is not acting in a spirit of captious criticism. On the contrary, it is hoped that publication of these comments at a time when preliminary plans are being laid for 1934, will lead to further discussion of the subject which will be of benefit to all concerned.

I HAD an opportunity to check up at the New York show the trend in the smaller cars, viewed from my point of view, which is that of a person six feet two inches tall.

I attempted to get into all the small cars, these being in the price range which it would be possible for me to be interested in. There was only one and only one model of that make in which I could get and sit in with an ordinary felt hat on without crushing the hat nearly flat on my head. Furthermore, when once in I could not see out sufficiently to be able to drive with what I consider safety, and I have been driving for 29 years, having started with a one-lunger.

My conception of an automobile is that it is or should be a vehicle into which one can get with comfort, and in which one can ride with comfort, ease and *safety*. This year's cars to my mind violate all of these conditions and substitute therefor pretty curves and colors. If you will pardon my frankness I think the car manufacturers are going stark plumb crazy. All the ballyhoo and advertising in the world will not alter the fact that the present cars are utterly unusable to quite a percentage of the population. I talked to one man at the show who was not as heavy as I am but who was six feet two inches also, and he said that he had tried them all and was sticking to his 1926 Cadillac as he could use it with some comfort. He had checked up on the larger cars, as he could afford that class, and he told me that there was none which he would consider as they were too difficult to get into and too uncomfortable when in.

The pat answer that is always given when complaint is made of the above features is, "Oh, you are unusually tall." This is boloney, however thin you slice it. In my own family of six the smallest member is five feet nine inches, and from that up to six feet five inches, four of us being six feet or over. In my company during the war we had 250 men from all over the country, and 40 of these were six feet or over. This is 16 per cent. My mother tried to buy a car last year and there was not a closed car she could sit in with a hat on, and they are worse this year.

I must know at least a dozen people of six feet who are in the market for a car, but they are not buying any until they can get into them.

I think it would pay the makers to make a little study of the size people we have in this country. A small person can ride in a car that will fit a large person, but the vice versa is not true.

At present I drive a 1930 Ford Model A Tudor. I had to drop the seat on this to use it, but I can see out and there is head room, and I can see the right fender, and I am going to keep it until a car is made that I consider usable.

I might add anent low tops on the cars that I had an uncle whose death was caused by hitting his head on the top after going over a bump. It cracked his skull and he never recovered from it although he lived several years afterwards. At the rate they are going now we are liable to see some broken necks from this cause this year.

All this means that the car makers are throwing out the window sales that they might have due to their own stupidity in not getting the dope on what the percentage of large people in this country is. And then they gripe and say the public won't buy cars.

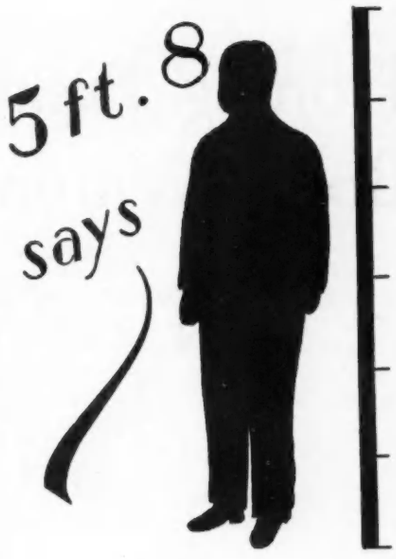
To summarize what I and lots of others I have talked to want in a car in the way of comfort is the following:

1. To be able to get into the driver's or back seat without being a trained contortionist.
2. To be able to sit in the driver's seat with an ordinary felt hat on and have at least two inches clearance over the hat.
3. To be able to see out of the side windows in an upward direction without tying a knot in the neck.
4. To be able to see the right-hand fender.
5. To be able to see the road not less than five feet ahead of the front of the radiator.
6. About 90 per cent less gadgets which can and do go wrong which cost time, money and trouble for servicing.

As you may have gathered from the foregoing I think the present cars from a practical viewpoint just a total loss. From the engineering standpoint they are very clever. But practical utility is what is being bought today, and they do not have it.

ASHLEY C. HEWITT.

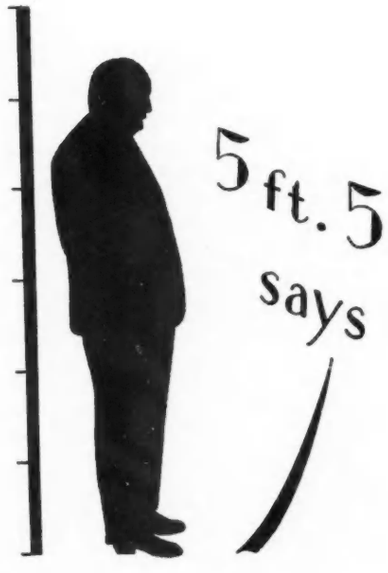
Body Trends



"IT IS getting along toward the time of year when motor car manufacturers announce loudly their new models; and perhaps we had better seize the chance to come right out and say what we think of the trend in motorcar design. Are you ready, men?

"We think it is terrible. We think motor-car designers have been gradually going crazy. The tendency today is to make a car that is more like a diving bell than a pleasure vehicle. Things were, in a way, better in 1917. Today the sill of the front window is on a level with the driver's upper teeth. He can't even spit comfortably. The cowl is on a level with his eyebrows, so that he can see ahead only by tying his neck muscles in a fisherman's knot. The windows are so tiny he has to shut one eye and squint through them as you would through gun sights. The top of the steering wheel is on eye level, designed to cut off 65 per cent of the forward vision. The seats are pitched in a nasty V-shape, to bring on stomach cramps with the least possible delay, and the whole car is built so low to the ground that it is a wonder it isn't infested with moles. The only way to get through the doors is by crawling through on one's hands and knees.

"Getting bitter, are we? Not at all. We have always liked automobiles, as such, and still do. We don't want them to forget some of their old virtues in the confusion of their new speed. We owned a Pope-Tribune once, and it was not so hot; but we distinctly recall that it was more fun to sit in than the elaborate bundle of nerves that whisks us about today. We owned a Model T Ford roadster once, and it wasn't so hot either; but we could hang our left leg out over the side when the day was warm and fine. Have you ever tried to hang your left leg out over the side of a modern roadster? You'd break every bone in your body. Those old cars had something; something worth remembering and hanging onto. Why do rich old ladies around town hang on grimly to their ancient limousines? It isn't the depression or the style that makes them do it. It's because the doors are high enough to walk through without getting your hat knocked off, and the seats are level enough to sit on without getting indigestion, and the windows are big enough to see out of."—E. B. WHITE in *The New Yorker*.



I WANT to protest about the absurd, and, as I see it, the dangerous practice of building cars so low and cowls so high that vision is seriously interfered with. If you look about you will find that many others feel just as I do, and more than one is refusing to buy a new car because he or she refuses to ride in a car that it is so hard to see out of and to get into. The shorter a person is the worse his vision, and the taller he is the harder it is for him to get into one of these low-down cars.

Now what's the excuse for all this? Looks, of course. Somebody says the car must look thus and so, whether it is comfortable and convenient for the user or not. Then there is the pretext that a low-down car is safer. Did anybody ever prove it? A low center of gravity perhaps helps a little in preventing a car from turning over under certain extremely rare conditions, but it adds to the skidding tendency under more frequent conditions, and when combined with or obtained by using the present absurdly low body, the poor vision adds a far worse and a continuous hazard. Locomotives with low centers of gravity were given up after a few trials because they tended to spread the rails. Those with higher centers hold the road better. Conditions are not identical with road vehicles, but are similar. There is a lot of hooey about low C. of G. as affecting safety.

Now nobody appreciates fine appearance in a car more than I do, and I am thoroughly aware that it is an extremely important factor in controlling sales. I do not advocate going back to the high chariots of past years, but I do say that the present vogue is outlandish and wholly unwarranted. To say that one cannot build a car that is comfortable, easy to enter and easy to see out of once you are seated in it, and still make it fine appearing is simply to utter a fallacy. To make a car low is not the only way to make it graceful and attractive. It is only *one* way, and a very bad one as I see it.

HERBERT CHASE.

At the time Mr. Chase wrote this letter, he was a consulting engineer in New York. He is now Engineering Editor of *Automotive Daily News*.

Honing Finishes Big End Bores Within 0.0003 in.

New method being used by both Ford and Plymouth in regular rod production

by A. F. Denham

Field Editor, Automotive Industries

HONING, a process normally associated in the automotive industry mainly with the finishing of cylinder bores, is now being adapted on a widening scale to the finishing of connecting rod lower end bores. This development had its inception with the introduction last year of interchangeable connecting rod liners (see *Automotive Industries*, Feb. 11), which liners require extreme accuracy in the finishing of the big end bores to assure a perfect seat.

Another characteristic of these new liners is that they work better with light rather than very rigid rods (formerly required to protect the relatively thicker lining of babbitt previously used). The lighter, more flexible rod structure makes accurate finishing somewhat more difficult since distortion must be avoided.

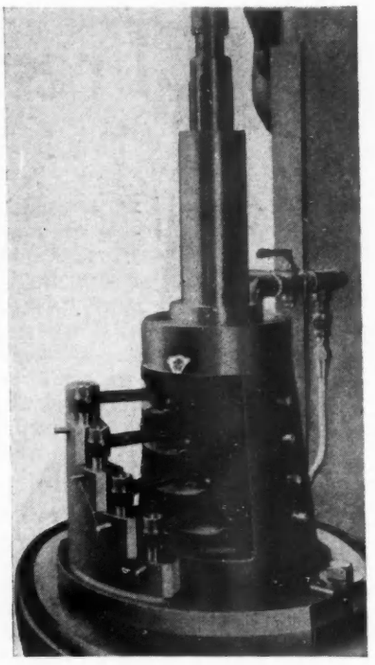


Fig. 2—Detail view of the Barnes Drill Co. honing machines, set up to finish four Plymouth connecting rod big end bores

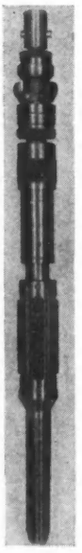


Fig. 3—The honing tool developed by Micromatic Hone Company

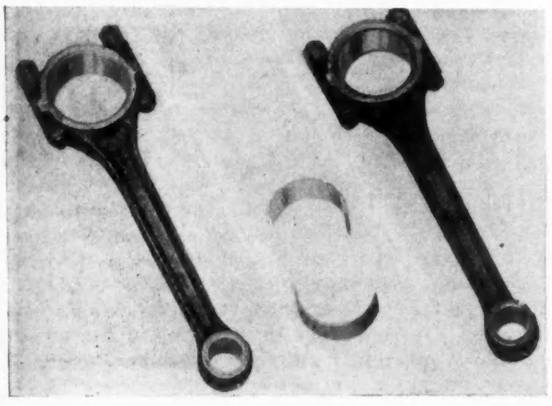
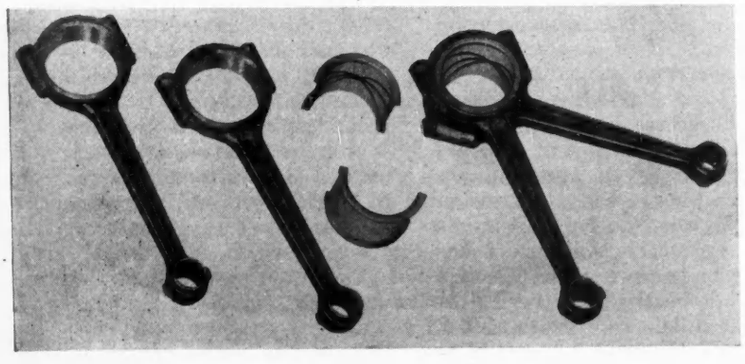


Fig. 1 — Upper view shows Plymouth connecting rods with inserted bearings and the lower view those of the Ford V-8



It is to meet these requirements that hones have been developed—notably by Micromatic Hone Company of Detroit—together with special machine tool equipment for finishing the big end bores. The same type of hones of course, would be applicable to finishing other small bores in which high accuracy is a major requirement, as is the case with antifriction bearing races, etc.

Two examples where such a set-up is used are at plants of the Ford Motor Company and Plymouth Motor Corp. Plymouth uses the interchangeable liner, while on the Ford V-8 high accuracy of rod finish is required by the floating bearing type of side by side rod design. The rods in question are shown in assembled and disassembled condition in Fig. 1. Both types are finished on a Barnes Drill Company No. 204 twin-cylinder, hydraulically controlled honing machine fitted with Micromatic hones. The Plymouth set-up is shown in Fig. 2, in detail, four rods being honed simultaneously.

The full automatic three-finger type hone used is shown in Fig. 3.

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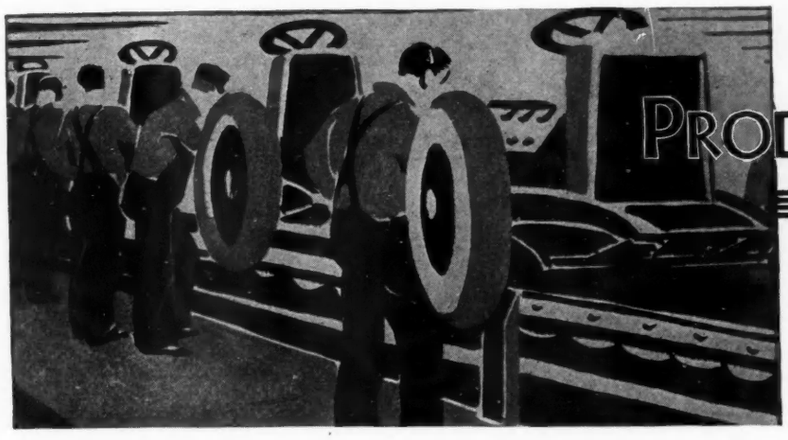


PRODUCTION LINES

Fine Showing

According to *The Parkerizer*, the Detroit show included 246 passenger cars and trucks. A count of noses proved that 106 had Bonderized fenders and sheet metal, while 57 passenger cars boasted Parcolited bodies. Surely an enviable record.

Polygonal Polyhalite

At the last meeting of the A.I.M.M.E., the U. S. Bureau of Mines reported that the new process for extracting Polyhalite is almost ready for industrial exploitation. Polyhalite is a complex mineral containing sulphates of potassium, magnesium, and calcium. It was discovered in 1820 but remained a museum curiosity until about five years ago. By means of the new process, Polyhalite is said to yield fertilizer, the heavy chemicals, and magnesium.

For Better Safety

One of the most practical bulletins that comes over our desk is the monthly news letter of the National Safety Council. The automotive and machine shop section gives the following practical measures for lessening the hazard of carbon tetrachloride poisoning.

1. Maintenance of concentration below 500 parts of vapor per million parts of air.
2. Use of venting systems with intake at floor level.
3. Pre-employment physical examinations. Repeat examinations at monthly intervals.
4. The use of closed systems.
5. Emergency use of positive pressure respirators.
6. The avoidance of skin contact with vapor.
7. The addition of other substances to carbon tetrachloride have not completely eliminated the hazard. They may decrease the boiling point somewhat, but the tetrachloride exerts some vapor pressure even at freezing point of water.
8. Although carbon tetrachloride is less toxic than benzol and dissimilar in its action, it falls in the same general category of dangerous industrial agents.

Variegated Segments

Segmental grinding wheels offer many advantages and have increased in usage thereby. "Grits and Grinds" for January-February, 1933, has a very interesting discussion in which the advantages of this construction over that of solid wheels is thoroughly covered. The following list of advantages has been lifted from the article. You'll have to read the whole story if you are interested in cutting grinding costs. Here is the list:

1. Cost per set is usually less than wheel of similar size.
2. Production per unit time is increased because clearance between segments allows better cutting ability.
3. Heavier cuts can be taken without danger of breakage.
4. The amount of usable abrasive is increased.
5. Handling, mounting, and transit breakages are minimized.
6. Storage space necessary to maintain an adequate supply is reduced.
7. Manufacturing time is shortened.

Starting Diesels

We're beginning early to learn about the starting equipment for automotive Diesels. The brief experience in this country proves that the Diesel presents no difficult problems. But it does demand a heavy battery discharge for an instant. That is, it starts quickly but takes a lot of juice to budge. On this basis, a heavy-duty engine builder recommends a battery with not less than 17 plates and perhaps 21 plates. The ideal battery is one with the largest number of plates, the plates being thick enough to withstand the heavy discharge rate.

Roll Your Own

"How to Make Your Own Carboloy Tools" in a new booklet that solves the problem of making cemented-carbide tools in your shop. Thus saving a lot of money. Instructions are given concerning the machining of the shank and brazing the Carboloy tip. The latest dope is that you can braze successfully with the oxy-accetylene torch. A copy of the manual is yours for the asking.

E-P Lubes

While the Bureau of Standards and the S.A.E. research committee are busy studying E-P lubes for the industry, there is much activity under the surface. Worm drives and hypoids have taken hold and are giving a good account of themselves in service. We learn from one prominent axle maker that he has established a dead line in his specifications. 13,000 lb. per sq. in. bearing pressure is the limit for ordinary lubricants; above this, some acceptable E-P lube is recommended. How does this check? Another thing this axle maker has learned is to build the job so as to assure a circulation of lubricant to the pressure areas. Which is as important as having the right lubricant.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Strong Swing to Lowest-Price Group Indicates Sharp Drop in Dollar Sales

PHILADELPHIA — A substantial shrinkage in dollar volume of factory sales during the first two months of the year despite an increase of about three per cent in the number of units produced, is indicated by production figures classified by wholesale price groups. Production in the "Under $500" class was 65 per cent ahead of the 1932 two-month period, while production in all other price classes dropped 53 per cent. Comparative figures for the first two months of 1933 and 1932 follow:

	1932	Per Cent of Total	1933	Per Cent of Total
Under $500	94,277	47.00	155,918	75.80
$501-$1,000	87,254	43.50	41,136	20.00
$1,001-$1,500	12,321	6.10	4,754	2.30
$1,501-$2,000	3,147	1.60	2,082	1.00
$2,000 and up	3,520	1.80	1,945	0.90
	200,519	100.00	205,835	100.00

TRUCK PRODUCTION BY CAPACITIES
Two Months 1932 and 1933 Compared

	1932	Per Cent of Total	1933	Per Cent of Total
1½ tons and under	42,893	94.3	35,854	95.0
2-3 tons	1,763	3.9	1,478	3.9
3½ and over	665	1.5	279	0.7
Ambulances, fire, buses, etc.	130	0.3	138	0.4
	45,451	100.0	37,749	100.0

DeLuxe Plymouth is Four Inches Longer

New Cars Priced Up to $30 Higher than 108-in. Models

DETROIT—Dealers are now receiving shipments of a deluxe line of Plymouth six cars with 112-in. wheelbase and all-silent transmissions. The new cars are an addition to the 108-in. models, Harry G. Moock, general sales manager, stating that it will be Plymouth's policy to manufacture two lines.

Hoods and runningboards are longer than on the PC models, the radiator design has been revised, and there is a new upholstery treatment. A most attractive instrument panel with glove compartment on the right side is another new feature. Prices are reported as follows:

	PD Series 112½ in.	PC Series 108 in.
Business coupe	$495	$495
Two-door sedan	525	505
Rumble seat coupe	545	525
Four-door sedan	575	545
Convertible coupe	595	565

Terraplane Six Truck Prices

DETROIT — Shipments of three body types on the new Essex Terraplane Six half-ton commercial chassis are not going to dealers. List prices are as follows:

Sedan delivery	$545
Standard panel	530
Cab pickup	440
Chassis	375

NE

Late Factory Sales and Output Reports

DETROIT—Chevrolet first quarter production of cars and trucks was 148,336 against 133,363 in the same period last year. March output was 38,665 against 38,890 in 1932. Production of standard models numbered 10,743 in March and of the master line, 27,922.

Retail deliveries of Studebaker and Rockne cars in the last 10 days of March reached the highest level since June, 1932, totaling 1758. Employment is being stepped up toward the 5000 mark.

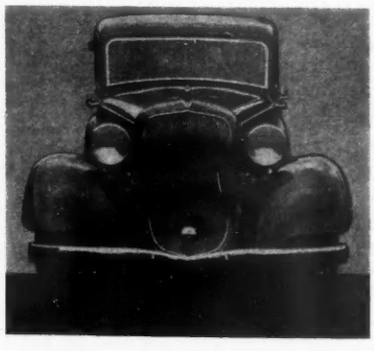
A rush of sales in the last 10 days of March brought Pontiac's total for the month to 5207. Buick sales in March amounted to 3111 cars.

First Reports on March Sales Are Encouraging

PHILADELPHIA—The first cities to report on March registrations of new cars show sales total comparing favorably with February, despite the interruption of the banking holiday. A few individual reports follow:

	Mar. '33	Feb. '33	Mar. '32
Chicago (Cook Co.)	3,031	2,217	3,091
Philadelphia	1,425*	1,114	1,740
Cincinnati	637	632	603
Columbus, Ohio	285	338	528
Dayton, Ohio	212	206	248
Louisville, Ky.	318	276	276
Detroit (Wayne Co.)	1,680	2,045	2,462

*Preliminary.



New deluxe 112-in. wheelbase Plymouth

WS—

Production Expansion Foreshadowed as March Ends With Strong Sales Upswing

Factory Officials Elated as Retail Delivery Reports Exceed Expectations—Dealer Stocks Show Definite Decline in the Last Two Weeks

DETROIT—"Highly elated" probably is a rather conservative term to use in describing the reactions of automobile company executives as sales reports for the closing days of March began to roll in. A not inconsiderable number of important executives had expressed the belief that sales, rebounding following reopening of banks throughout the country, would show a falling off during the last week or 10 days of March.

That this recession has not occurred, and that in fact the last week or 10 days showed an even larger jump than the previous week came to many as a distinct surprise. It may be roughly estimated that the final 10 days of March produced sales just about equal to the first 20. In the case of several producers of automobiles, deliveries for the week ending April 1 actually exceeded the corresponding week of last year by from five to 15 per cent.

In some cases production schedules have had to be increased because of too radical previous curtailment. Plymouth, which had been virtually shut down early in the month, for instance, issued a statement that production schedules for April are only slightly below those for the biggest month in the company's history.

A continuance of the present trend in retail sales undoubtedly will eventually force a stepping up in production schedules even for those companies which are regarding the present situation with the utmost conservatism. Dealer stocks have been definitely declining during the past two weeks. A number of companies, however, believing that recent spurts were of a temporary nature, have permitted new car stocks to decline while holding production levels to a point where continued production without shutdowns would be automatically insured.

Akron Disaster Ends A. F. Masury's Career

Mack Chief Engineer Aboard as Admiral Moffett's Guest

NEW YORK—The tragic crash of the Akron brought to a close the career of one of the industry's most colorful figures and one of its best known motor truck engineers—Alfred Fellows Masury, vice-president, chief engineer and a director of the Mack International Motor Truck Corp.

Alfred F. Masury

Mr. Masury, long an aircraft enthusiast, was present on the ill-fated dirigible as the guest of Rear Admiral Moffett, chief of the Navy's Bureau of Aeronautics, who also went down with the Akron. Prior to his last flight, Mr. Masury had done much air traveling and in 1929 was a passenger on the Graf Zeppelin when it made an unsuccessful attempt at a transatlantic flight. It will be recalled that on that occasion the Graf was caught in a storm over France with five of its six engines dead and was finally landed with great difficulty at Toulon.

Born on Sept. 2, 1882, at Danvers, Mass., Mr. Masury was 50 years old. He was educated at Brown University, from which he received a degree of mechanical engineer. Following early connections with the General Electric Co., Corwin Mfg. Co. and others, in 1910, he joined the Hewitt Motor Co. in New York. In 1911, he was with the Metzger Motor Car Co. Subsequently he became Hewitt factory manager and, in 1913, was manager of the general sales department of the International Motor Co., New York. Since 1915 he has been chief engineer of that company and since 1920 a vice-president.

Mr. Masury was active in S.A.E. affairs, having been a member of the Standards Committee, a second vice-president of the Society, vice-chairman of the Metropolitan Section, chairman of the Ordnance Advisory Committee, member of the Professional Activities Committee, etc. He was also a colonel in the Army Reserve Corps.

He is survived by his wife, the former Edna Lanphear.

March Production About 90,000

DETROIT—Motor vehicle production approximated 90,000 units in March, preliminary estimates indicate. This total compares with 106,814 in February of this year and 127,000 in March of last year. Production indexes corrected for seasonal variation and with 1925-1932 average equal to 100, follow:

March, 1932	23
February, 1933	35
March, 1932	32

Longer Dodge Sixes Now in Production

DETROIT—Dealers are now showing a new series of Dodge six-cylinder cars on a 115-in. wheelbase, superseding the previous model on a 111¼-in. wheelbase. No changes have been made in list prices. Lengthening of the car is reflected in longer hoods and running boards, there having been no changes in body dimensions or fender lines. As one result of the increased length ahead of the dash, the power-plant proper is now located completely behind the front axle, the latter having been moved forward 3¾ in.

Cadillac N. Y. Branch Takes on Oldsmobile

NEW YORK.—Effective April 1, the New York and Brooklyn branches of the Cadillac Motor Car Co. took on the representation of the Oldsmobile line. The Cadillac company maintains two stores in Manhattan, two in Brooklyn, and one each in the Bronx, New Rochelle, White Plains and Yonkers, all of which will sell and service the Oldsmobile.

Charles A. Lindbloom

DETROIT—Charles A. Lindbloom, 43 years old, mechanical engineer for Wilcox Rich, died in Battle Creek on Monday of this week.

Final 1932 Gasoline Consumption Totals Down 6.2 Per Cent from Preceding Year

NEW YORK—Final gasoline consumption figures by states as compiled by the American Petroleum Institute reveal that total consumption for the country dropped 6.6 per cent as compared with the consumption of 1931. This decline is approximately the same as that for motor vehicle registrations which showed a drop of 6.2 per cent as compared with 1931. Three states and the District of Columbia show an increase in consumption over 1931, these increases ranging from 9.8 per cent for the District of Columbia to 0.3 per cent for the State of Delaware.

The figures listed in detail below are based on the quantity of gasoline sold or offered for sale as reported by wholesalers and dealers in the various states under the provisions of the gasoline tax or inspection laws.

While it is felt that the figures herewith are fairly comparable, it must be borne in mind that more or less widespread tax evasion and changes in the basic laws under which the figures were collected over the two year period outlined may have disturbed the comparability of the figures. It is not, therefore, entirely correct to base percentage changes in demand upon the figures presented below.

Gasoline Consumption by States

	1931	1932	Per Cent Change		1931	1932	Per Cent Change
Ala.	162,672,000	136,435,000	—16.0	Nebr.	228,200,000	198,914,000	—12.8
Ariz.	74,461,000	69,592,000	— 6.5	Nev.	23,544,000	23,329,000	— 0.7
Ark.	127,074,000	114,031,000	— 9.2	N. H.	68,305,000	65,746,000	— 3.7
Calif.	1,401,544,000	1,352,570,000	— 3.5	N. J.	711,128,000	698,790,000	— 1.9
Colo.	176,494,000	158,898,000	—10.0	N. Mex.	52,222,000	46,760,000	—10.5
Conn.	247,891,000	245,184,000	— 1.1	N. Y.	1,625,571,000	1,587,606,000	— 2.4
Del.	38,106,000	38,259,000	+ 0.3	N. Car.	255,691,000	232,071,000	— 9.0
D. C.	93,493,000	102,695,000	+ 9.8	N. Dak.	114,789,000	97,918,000	—14.5
Fla.	231,988,000	208,913,000	— 9.8	Ohio	984,809,000	903,091,000	— 8.2
Ga.	221,893,000	199,031,000	—10.3	Okla.	300,357,000	268,128,000	—10.7
Idaho	59,753,000	52,392,000	—13.0	Ore.	174,550,000	158,199,000	— 9.5
Ill.	1,047,687,000	950,822,000	— 9.2	Pa.	1,062,602,000	1,041,061,000	— 2.1
Ind.	481,471,000	438,036,000	— 9.0	R. I.	98,157,000	101,039,000	+ 2.9
Iowa	412,424,000	356,445,000	—13.5	S. Car.	121,239,000	104,361,000	—13.8
Kans.	388,384,000	350,554,000	— 9.7	S. Dak.	134,514,000	110,709,000	—18.2
Ky.	176,203,000	164,058,000	— 6.8	Tenn.	214,369,000	180,722,000	—15.6
La.	187,955,000	166,014,000	—11.8	Texas	826,107,000	751,084,000	— 9.1
Maine	116,199,000	110,732,000	— 4.7	Utah	61,175,000	54,207,000	—11.3
Md.	188,930,000	193,950,000	+ 2.6	Vt.	49,151,000	46,860,000	— 4.8
Mass.	577,197,000	568,773,000	— 1.5	Va.	244,151,000	229,480,000	— 6.0
Mich.	821,584,000	765,063,000	— 6.9	Wash.	272,608,000	246,326,000	— 9.7
Minn.	441,914,000	401,081,000	— 9.1	W. Va.	143,981,000	129,621,000	—10.0
Miss.	123,000,000	107,286,000	—13.0	Wis.	455,649,000	408,667,000	—10.4
Mo.	492,572,000	458,672,000	— 6.7	Wyo.	39,477,000	35,375,000	—10.5
Mont.	75,645,000	67,860,000	—10.5	Total	16,628,880,000	15,497,410,000	— 6.6

Economists to Meet With Engineers

NEW YORK—A joint meeting of the Econometric Society, the American Society of Mechanical Engineers and the American Society for Testing Materials will be held in Chicago during Engineering Week. The two sessions of the meeting will be held at the Palmer House on Friday afternoon and evening, June 30.

The general subject of the afternoon session is to be "Theoretical Economics in Engineering." Among the prominent engineer-scientists who will take part in this section of the program are Dr. S. Karrer, Director of Research, Consolidated Gas Co., Baltimore, Dr. L. O. Grondahl, Director of Research, Union Switch and Signal Co., Dr. C. F. Roos, Secretary, Econometric Society, Dr. R. W. Burgess, Chief Statistician, Western Electric Co., and Prof. D. S. Kimball, Dean, College of Engineering, Cornell University.

The evening session will be devoted to a discussion of "Fundamental Problems of Mutual Interest to Scientific Economists and Engineers." Taking part in the discussion will be Professor Joseph Schumpeter, Harvard University, Dr. F. B. Jewett, Vice-President, American Telephone and Telegraph Co., and Dr. A. P. Flemming, Director of Research, Metropolitan-Vickers Electrical Co., England.

Fisk Rubber Property Sold for $3,030,000

CHICOPEE FALLS, MASS. — A bid of $3,030,000 by Orrin G. Wood of Boston, representing the so-called reorganization committee, bought the real estate, buildings and other property of the Fisk Rubber Co., at a receiver's auction sale held here on Monday of this week. Purchase by the Wood committee is believed to assure continuation of operations. Cash amounting to about $7,000,000 was not included in the transaction.

The only other bidder was William O'Neill, president of the General Tire and Rubber Co.

The price bid assures a "substantial and satisfactory" distribution to the holders of Fisk bonds and notes, it is reported.

Reo More Liquid Despite 1932 Loss

Nearly $2,000,000 Over 1931 Working Capital Increased

LANSING, MICH.—Reo Motor Car Co. for the fiscal year ended Dec. 31, 1932, showed a net loss from operations of $1,972,480. With depreciations and tool amortization added the net loss transferred to surplus equalled $2,878,938 as compared with $2,749,238 in 1931. While the earned surplus account for the company declined from $3,304,882 as of January 1, 1932, to $422,656 as of Dec. 31, consolidated surplus was increased to $5,284,296 as the result of a reduction in par value of Reo common stock, offset by a revaluation of assets, equivalent to a net increase of $4,861,640 in the consolidated surplus account. Cash on hand and in banks given as $4,700,002 with total current assets of $9,984,354 as against total current liabilities of $1,398,148. Current assets show an increase of approximately $2,500,000 as against an increase in current liabilities of roughly $550,000. The statement shows a write-off on buildings, machinery and equipment equal to approximately 50 per cent of their valuation as given in the 1931 statement. Total sales for the year ending Dec. 31, 1932, were equal to $9,096,330.

Sterling-French to Handle Sundstrand

DETROIT — The Sterling-French Machinery Co. of this city has been appointed to represent the Sundstrand Machine Tool Co., of Rockford, Ill., in the Detroit territory and Province of Ontario. D. B. Burleigh, formerly vice-president and sales manager of the Sundstrand Machine Tool Co., will handle the Sundstrand line for Sterling-French.

Dodge Dealers Sell 25.5 Per Cent More

Dodge dealers' deliveries of Dodge and Plymouth passenger cars and Dodge commercial cars and trucks showed an increase of 23.6 per cent for the week ended March 25 over the volume recorded for the immediately preceding week, which itself topped the business of its respective predecessor by 49.5 per cent.

Retail deliveries made this year to date are 25.5 per cent ahead of last year.

Hayes Body Cuts Loss

DETROIT—Hayes Body Corp. cut its loss in 1932 to $294,076 after charges from $880,299 in 1931. Comparative data from the balance sheets follow:

	1932	1931
Cash	$11,230	$16,195
Total current assets	341,015	641,662
Total current liab.	276,701	179,399

Nothing Down and Five Years to Pay

An automobile agency in Rome which sells a popular priced Italian automobile, is offering all state employees, such as magistrates, officers, school teachers, and others, a plan whereby they may purchase an automobile on monthly payments extending over a period of five years, it is reported. No down payment is required of the purchaser it is said, and the plan is applicable on the purchase of any of the models which range in price from $513 to $1,750 U. S. currency. Another feature offered by the agency is a free driver's license to all persons purchasing a car who do not possess a license.

Stabilized Stainless Steels Announced

Titanium Added in New U. S. Steel 18-8 Alloy

CHICAGO—Announcement by subsidiary companies of the United States Steel Corp. was made this week, of the development of a method of stabilization of 18-8 (18 per cent chromium, 8 per cent nickel) stainless steels with titanium addition. This is said to remove the hazard of intergranular corrosion, a phenomenon which has heretofore been such a serious factor in installations where heat treatment is impracticable after welding.

The process and methods of heat treatment used in the production of USS Stablized 18-8 are covered by patent applications now pending on behalf of the subsidiary companies of the United States Steel Corp. This improved product will be marketed as USS Stabilized 18-8 and is now available in all stainless steel products manufactured by subsidiary companies of the corporation.

Dickinson and Warner Tour S.A.E. Sections

NEW YORK—Leaving Washington on April 2, Dr. H. C. Dickinson, president of the Society of Automotive Engineers, and John A. C. Warner, general manager of the organization, will spend the better part of the month visiting members of the Society from coast to coast. Among the S.A.E. Sections at which Dr. Dickinson and Mr. Warner have already appeared are the Indiana Section (joint meeting with Dayton Section), at Indianapolis, on April 3; Chicago, April 4; Milwaukee, April 5; St. Louis, April 6; Kansas City (Mo.), April 7, and Wichita, April 8. They will conclude their trip with talks before the Denver Club of the S.A.E., April 11; Southern California Section at Los Angeles, April 17; Northern California Section at San Francisco, April 19; Oregon Section at Portland, April 21; Northwest Section at Seattle, April 22.

Berend New Chevrolet Advertising Assistant

DETROIT—H. J. Klingler, vice-president and general sales manager of Chevrolet Motor Co., has announced the appointment of F. A. Berend as assistant advertising manager, succeeding W. C. Byers, who has been transferred to national used car promotional work with headquarters in the Detroit office.

Mr. Berend has had twelve years of merchandising experience to qualify him for this work. He has had newspaper, advertising agency and outdoor connections and recently held an executive post with one of New York's leading hotel groups.

Plymouth Has Record Day

DETROIT—Harry G. Moock, general sales manager of Plymouth Motor Corp., has reported that more orders for the new Plymouth six were received on Wednesday, March 29, than for any day since the announcement of the car last November. The total received for that day was 999, all for immediate shipment.

Hudson Sales Up 20%

DETROIT—Chester G. Abbott, general sales manager of the Hudson Motor Car Co., reports a definite upturn in retail sales throughout the United States. Last week's sales reports showed a 20 per cent increase over the previous week which was reported as 65 per cent greater than the week ending March 11.

Chevrolet Maintains Sales Lead over '32

Second 10 Days in March Almost Equals Last Year Despite Banking Holiday

DETROIT — Chevrolet dealers in the second ten days of March reported retail deliveries of 9906 new cars and trucks, despite the existence of a national banking holiday through much of the period, according to an announcement by H. J. Klingler, vice-president and general sales manager of the Chevrolet Motor Co.

In the comparable period last year retail reported sales were 10,378 new cars and trucks, Mr. Klingler stated.

Owing to the difficulty of getting cars to dealers because of lack of facilities for clearing drafts, stocks of new cars in the field were reduced 3489 units in the second ten days of the month, Mr. Klingler reported.

"From the first of this year to March 20 deliveries to consumers were 87,968 units as compared with 86,769 in the comparable period of 1932," Mr. Klingler stated.

In the last ten days of March last year retail sales totalled 13,504 units, and Chevrolet is hopeful that a sufficient amount of buying deferred by the banking situation will fall into the last period of this month to make the March total compare favorably with March, 1932.

Thomas Bert Bennett

MUSKEGON, MICH. — Thomas Bert Bennett, 43 years old, president and organizer of the recently former Muskegon Bennett Company, died last week of a heart attack. He was formerly head of the Bennett Pumps Corp., which was moved to Pennsylvania. The formation of the Muskegon Bennett Co. which was organized to manufacture oil and grease pumps and tanks for oil distributing trade, was reported in AUTOMOTIVE INDUSTRIES Feb. 25th issue.

Terraplane Convertible Coupe

The new Terraplane Eight convertible coupe is priced at $695

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK—Further progress was made last week in clearing up the banking difficulties throughout the United States, and it is estimated that 80 per cent of the country's banks have been reopened. As a result of the seasonal demand and the postponed purchasing during the banking holiday, retail trade last week made an improved showing. Wholesale business also increased substantially.

Freight Loadings Increase

Railway freight loadings during the week ended March 25 totaled 475,850 cars, which marks an increase of 26,138 cars above those during the preceding week, but a decrease of 85,268 cars below those a year ago and a decrease of 263,030 cars below those two years ago.

Retail Trade Down

Department store sales in the New York Federal Reserve District, according to the Federal Reserve Bank of New York, during February were 23 per cent below those a year ago. Sales of wholesale firms were also 23 per cent below those a year ago.

Agricultural Prices Rise

The index of farm prices of agricultural products, according to the Department of Agriculture, on March 15 stood at 50, as against 49 a month earlier.

Power Production

Production of electricity by the electric light and power industry in the United States during the week ended March 25 was 6.9 per cent below that a year ago, while production in the preceding week was 10.6 per cent below that a year ago.

Crude Oil Production Increases

Average daily crude oil production for the week ended March 25 amounted to 2,249,650 bbl., as against 2,126,450 bbl. for the preceding week and 2,163,050 bbl. a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices during the week ended April 1 stood at 56.4, as against 56.6 the week before and 56.1 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended March 29 showed decreases of $126,000,000 in holdings of discounted bills, of $42,000,000 in holdings of bills bought in the open market and of $26,000,000 in holdings of Government securities. The reserve ratio on March 29 was 57.8 per cent, as against 55.5 per cent a week earlier and 49.1 per cent two weeks earlier.

Regulatory Bill Meets Strong Opposition

WASHINGTON, D. C.—Regulation of interstate motor carriers is unlikely to be a part of the emergency railroad legislation which the administration is expected to forward to Congress this week, according to the best information now available. Consequently the importance of the regulatory bill drafted last week by the railroads, utility commissioners, and the regular route truck operators' association, is somewhat dimmed for the present at least.

Moreover, following the release of its details, strong opposition to its provisions immediately developed. Representatives of the American Farm Bureau Federation, the National Grange and the National Farmers Union issued a memorandum opposing any federal regulation of rates charged by contract and private motor carriers and to any action or policy which might result in regulating motor vehicles rates upward primarily for the purpose of lessening competition for the railroads. Farm representatives also urged a separate regulatory authority for motor carriers.

Similar disagreement with the rate regulatory features of the bill was voiced by Roy F. Britton, director of the National Highway Users Conference.

Low-Price Producers Chief Steel Buyers

Larger Takings Improve Market Tone — Talk of Higher Prices Dies Down

NEW YORK—More orderly conditions in the Detroit banking situation resulted in "unfreezing" considerable business that was being held up pending the restoration of facilities for normal settlements of steel purchases. Nearly all of the steel-making districts reported gains in operating rates, with the increase in the activities of rolling mills close to Detroit making the best showing. Chevrolet and Ford releases continue to play a predominant role in the steel market, a good deal of business from other manufacturers being the subject of inquiries, without much of it having so far materialized.

Spokesmen for the steel industry are more than ever confident that before the coming of summer the steel mills of the country will have recovered much lost ground and be operating at a fairly profitable rate. Somewhat better inquiries for flat and other forms of steel from motor truck manufacturers have led to the surmise that, like in many other industries, the renascence of brewing is exerting a favorable influence on motor truck demand and that this is being passed on to steel producers.

For the time being prices come in for very little discussion. When, a month ago, the possibility of a general upward movement of commodity prices was forced upon the consideration of purchasing agents, protective contracts became a favorite topic of discussion. Developments since then have justified continuation of routine covering of nearby requirements. This, however, has by no means dispelled the hopes of steel producers, especially of sheet rollers, that before long consumers will be in a position to waive objections to moderate upward revision in prices of certain descriptions of finished steels that are now highly unprofitable to mills.

Pig Iron—The market is generally steady and of a routine character, with makers of some specialty irons taking a slightly firmer attitude. Movement of iron into automotive foundries, however, shows an upturn.

Aluminum—While there are a good many inquiries out for foundry metal over the current and third quarter, shipping orders are for the most part of the small lot, rush variety. Prices are unchanged.

Copper—The German disorders have added to the weakness of the copper market, that country having been a fairly good customer of American producers. Tonnages not absorbed by export will add just so much to the glut of unsold stocks here. Spot metal continues to be quoted at 5c., delivered Connecticut point.

Tin—Favorable statistical position of the market caused spot Straits tin to open the week at 24.70c., slightly higher than last week's close.

Lead—Dull and steady.

Zinc—Joplin district ore producers plan wholesale shutdowns and, as a result, the market for the metal has stiffened.

Industrial Leaders Watch 30-Hr. Bill

Interested in Ultimate Effects When Production Returns to Normal Level

WASHINGTON, D. C.—Although passage of the Black-Connery bill limiting working hours in manufacturing plants to five days totaling 30 hours in one week, remains uncertain its chances appear to be improving. Much depends on whether the administration gets behind it. The constitutionality of the measure is seriously questioned, although its sponsors in Congress insist that such legislation is within its powers.

The bill is being watched closely by the industry's leaders, not because it would impose any immediate difficulty in view of current low production, but because of its ultimate effects when business revives. There are indications that the 30-hour limit may be increased, that the bill will be revised to make its provisions permanent instead of limiting them to two years, and a minimum wage feature may be incorporated.

Willys Workers Get 20 Per Cent of Wages

Security Holders Form Protective Committees

TOLEDO—By order of the federal court and at the suggestion of L. A. Miller, receiver for the Willys-Overland Co., a 20 per cent payment to employees of the plant on wages due for weeks of Feb. 8 and 15 aggregating about $60,000 was made last Saturday and Sunday. Mr. Miller said he hoped to have another distribution ready by the middle of the month. An effort will be made by the receiver also to pay local taxes in installments as rapidly as funds may become available.

It was announced that a bondholders' protective committee has been formed under chairmanship of G. Munro Hubbard, New York. There are $2,000,000 of the bonds outstanding and the last of them will be due next Sept. 1.

Formation of a protective committee for preferred stockholders of the Willys-Overland Co. was started Tuesday when agreements were mailed to all preferred stockholders.

H. J. Leonard, chairman; J. E. Parsons, W. B. Stratton, C. O. Miniger, and Ward M. Canaday are members of the committee and the Toledo Trust Co. has been named depository for the stock. Chairman Leonard is a former vice-president of Willys-Overland, was president of Stearns-Knight, and now is serving as president of the Ottawa Hills Co., large land-owning corporation controlled by John N. Willys.

Sir William Letts, managing director of the Willys-Overland-Crossley, Ltd., Manchester, England, is now at the plant for conferences with the receivers and executives.

Sauce for the Gander

The railroads having offered the government a bill providing in detail for the regulation of interstate motor transportation, perhaps it would not be out of place to suggest that the Highway Users Conference counter with a bill specifying for the administration how railroads should be regulated.

Sloan and Chrysler on New Bank's Board

DETROIT—Among the automotive names on the board of directors of the new National Bank of Detroit are Alfred P. Sloan, Jr., president, and Donaldson Brown, vice-president, of the General Motors Corp.; Walter P. Chrysler, president and chairman of the board of the Chrysler Corp., Henry E. Bodman, former vice-president and general counsel of the Packard Motor Car Co., and Frank Couzens, son of Senator James Couzens and president of the Detroit City Council.

James Inglis, president of the American Blower Co., has been elected chairman of the board of the new bank while Walter S. McLucas has been named president. Mr. McLucas comes from Kansas City, where he has been board chairman of the Commerce Trust Co. He is a former vice-president of the National City Bank, New York, and is a member of the Federal Reserve Advisory Council.

Other directors include J. T. McMillan, president D. & C. Navigation Co.; J. S. Holden, president of J. S. Holden Real Estate Co.; P. J. Monaghan, member of Monaghan, Crowley, Reilly & Kellogg; J. B. Ford, Jr., vice-president of Simplex Paper Corp; R. Perry Shorts, director of Michigan Bell Telephone; Stanley F. Reed, general counsel of Federal Farm Board, and Tracy W. McGregor.

National Acme Transfers Operations to Cleveland

CLEVELAND—Acme and Gridley automatic screw machines and chucking machines, heretofore manufactured at Windsor, Vt., will in the future be made at the National Acme plant here, President F. H. Chapin announced. The entire stock of spare and replacement parts and standard tooling has already been moved to Cleveland.

Federal Aid's Future Causing Some Concern

Continuation of Highway Bureau Hinges on Action on Needed Appropriations

WASHINGTON. — Motor and highway interests are showing a great deal of concern over prospects for additional funds for road work and even the continuance of the Bureau of Public Roads, in charge of appropriations for federal and state aid in road building. While it is generally not thought conceivable that these funds will be stopped or that the Bureau of Roads will be "mopped" up in any reorganization plan, the situation as it exists today is discomforting to say the least.

The last authorization of the regular federal aid money was for the fiscal year 1933, ending June 30 of the current year. Virtually all of this money thus far authorized has been obligated to particular projects.

The emergency appropriation of $120,000,000 in the relief act of July 27, 1932, also has been practically obligated to the limit. The unobligated balances of both kinds of funds largely are to be distributed among about one-half dozen states.

Nevertheless, the Chief of the Bureau of Public Roads has instructed district engineers temporarily at least to suspend approval of new projects, involving further obligations of either fund pending decision as to what will be done with the money.

Assuming that all money of both kinds are available, the active construction program will come to an end in about one-half of the states by July 1 of the present year and in the remaining states they will reach a low level by Sept. 1 and by Jan. 1, 1934, work will practically cease unless additional funds are appropriated in the meantime. That would mean an end of the Bureau of Public Roads, and this necessarily has occasioned the hope that the administration will act soon and see that Congress proceeds with required appropriations.

Studebaker Enters April With 1500 Cars Ordered

SOUTH BEND — Studebaker entered April with 1500 unfilled orders according to Paul G. Hoffman, vice-president in charge of sales. Orders received in the last ten days of March totaled up to 2400 cars.

A. J. Picard

NEW YORK—A. J. Picard, one-time member of the well-known jobbing firm of Picard-Ryan and brother of Leo Picard, local Ford dealer, died here last week. Recently he had been associated with his son, "Dick" Picard, in the Picard-Sohn advertising agency.

Frontenac Four Makes Its Debut

TORONTO — Dominion Motors Products, Ltd., with factory at Leaside, a suburb of Toronto, has brought out its new Frontenac Four, powered with the Red Seal Continental motor, as the Canadian sister to the Continental low-priced car in the United States. Canadian prices for the new line are as low as $595 at factory, taxes extra. The standard coupe is quoted at $620; the 2-door sedan, $620; 4-door sedan, $670, and the special 4-door sedan, $700, taxes extra.

First Quarter Profit for Bohn

DETROIT — Bohn Aluminum & Brass Corp. earned a net profit of $75,000 in the first quarter of this year, Charles B. Bohn, president, estimates, contrasted with a loss of $73,201 in the corresponding quarter in 1932.

Austria Cuts Car Import Quotas

WASHINGTON, D. C.—The Austrian government has reduced the quota on automobiles which may be imported into Austria during 1933, from 170 to 130 units per country, according to a radiogram received in the Department of Commerce's Division of Foreign Tariffs.

Reynolds Spring Reports

JACKSON, MICH. — Reynolds Spring Co. has reported for year ended Dec. 31, 1932, net loss of $192,-152 after depreciation, interest, and other charges, compared with net loss of $195,107 for the year 1931.

Citroen Shut Down

PARIS — The Citroen plant here has been closed following interruption of production caused by protests against pay cuts. A total of 21,000 are reported to be affected.

Activities Commission Launched by N.A.D.A.

ST. LOUIS—President F. W. A. Vesper of the National Automobile Dealers Association announces the formation of a National Activities Commission which will be composed of outstanding individual dealers in each market center of America.

The members of this commission will function as the individual representatives of the association in their respective communities and will directly and personally transmit to all local members the policies and activities of the association.

"By this plan," says President Vesper, "the association headquarters will be fully and promptly advised at all times of conditions in every market, and in turn local members will be served by the constructive activities of the association in a speedy and efficient manner. The local national activities committeeman will bring closer together the association as a whole and the individual local members of it.

WHY NOT?

The following is the title of a bill recently introduced in the Georgia legislature, according to the American Petroleum Industries Committee. It was ruled out of order and given no further consideration.

"However," the committee says, "it is worthy of consideration by those interested in proposed legislation affecting transportation. While admittedly facetious, impossible of enactment, and probably unfair, it indicates the type of legislation that might be suggested were a few of the regulations and restrictions railroad interests have sought either directly or indirectly to have imposed upon highway transportation applied to railroad operations."

The bill follows:

"To be entitled: An Act to regulate the speed, size, weight, and other dimensions of trains operated by Steam Railroads intra-state within the State of ..... by limiting speed of locomotives to 40 miles per hour, except in incorporated towns and cities, where speed may be reduced by municipal enactment to 10 miles an hour; by requiring trains to come to a full stop at grade crossings and to be led over said crossings by a brakeman carrying a bell by day and a lantern by night; by requiring electrification of all steam railroads within incorporated limits of cities of 25,000 population or over in order to abate the smoke nuisance; by requiring railroads to eliminate grade crossings in all cities and towns of 10,000 population or over, by requiring railroads to redraft time tables in understandable form and terms, and providing for a commission to decide what are understandable forms and terms; by requiring conductors to answer questions pleasantly, and to explain time tables at any time on request of any passenger; by requiring railroads to provide free pillows in Pullman cars by day; by prohibiting infants in arms from riding trains, but allowing dogs and other animals to be carried in passenger cars; by requiring separate Pullman cars to be operated for convenience of persons of the black race; by prohibiting the serving of eggs older than one day on Pullman diners; by regulating heat in railroad cars to 60 degrees and making it a misdemeanor to overheat cars; by prohibiting the building of upper berths in Pullman cars and providing for the destruction of all present upper berths; by requiring radio equipment to be carried on all railway cars, with separate headphones for each passenger; by requiring trains to carry life boats and life preservers where such trains cross rivers wider than 25 feet; by requiring rear vision mirrors for engineers and cinder-proof screens for passenger cars; by limiting the gross weight of trains to 15,000 pounds, breadth to six feet, height to 9½ feet, and length to 40 feet; by limiting drive wheels to two; by requiring trains to stop anywhere on being flagged by hitchhikers, and for other purposes."

Harry E. Pence

MINNEAPOLIS, MINN.—Funeral services closed the colorful career of one of the pioneer automobile dealers of the Northwest, Harry E. Pence, formerly president of the Pence Automobile Co., which up to three years ago distributed Buick cars in this territory. Mr. Pence died unexpectedly Wednesday, March 29, in Dayton, Ohio, while on his way home from a sojourn at his Florida winter home. He started his automobile career in Minneapolis in 1903. In 1922 he formed the Buick Pioneers Association He was interested in civic affairs, serving on the library board. Several years ago he went into the suburban railroad business, buying a line operating to Northfield, which became an important freight belt line. In 1927 he acquired another line running west.

Frederick W. Parsons

CORNING, N. Y.—Frederick W. Parsons, vice-president of the Ingersoll-Rand Co., died at his home here April 1, following an illness of several weeks. He was 66.

As an engineer, Mr. Parsons introduced changes in air compressors that made possible extensive advancement in construction work depending on air compressors.

McLaughlin on Nickel Board

TORONTO — R. S. McLaughlin, president of General Motors of Canada, Ltd., was elected to the directorate of International Nickel Co. of Canada, Limited, at the annual meeting here.

Plane Motor Makers May Run Own Tests

WASHINGTON, D. C.—Aircraft engine manufacturers having suitable testing equipment may now conduct tests of engines for Department of Commerce type approval at their factories if they so desire instead of submitting them to the testing laboratory of the Aeronautics Branch in Washington, Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, announced today.

Tests made by a manufacturer on his own engine testing equipment will be witnessed and certified to by designated Department of Commerce inspectors.

Ludlum Appoints Floyd

WATERVLIET, N. Y.—Ludlum Steel Co. announces that P. E. Floyd has been appointed district sales manager in charge of the Chicago territory. Prior to his recent appointment, Mr. Floyd acted in a similar capacity for the Associated Alloy Steel Co. He is an old Ludlum man, having been Chicago manager for Ludlum prior to the formation of Associated Alloy Steel.

Studebaker Exports Gain

SOUTH BEND.—March export passenger car and truck orders for units of Studebaker and White manufacture from dealers in world markets represent the largest dollar volume of business since May, 1931, according to Arvid L. Frank, vice-president of Studebaker Pierce-Arrow Export Corp.

Maccar Receiver Named

SCRANTON, PA.—J. F. W. Heinbokel has been appointed receiver of the Maccar Truck Co. and its affiliate the Maccar Corp., by the United States District Court.

U. S. Rubber Offers Cash and New Notes

NEW YORK—F. B. Davis, Jr., president of the United States Rubber Company, announces that the company offers to holders of maturing 6 per cent notes 30 per cent in cash and 70 per cent in new three-year secured 6 per cent notes.

There will be an immediate payment of 10 per cent in cash as well as the coupon due June 1, 1933, to all noteholders assenting to the plan prior to May 1, 1933, with payment of the additional 20 per cent in cash upon surrender of the notes when the plan is declared operative.

The new three-year 6 per cent gold notes will be secured by pledge of United States Rubber Company first and refunding mortgage 6 per cent gold bonds, Series "B," due Jan. 1, 1947, to the extent of 250 per cent of the principal amount of said notes, as against 133 1/3 per cent security under the maturing notes.

Automotive Oddities—By Pete Keenan

Write us if you know an Oddity

WARNING
SPEED LIMIT
15 MILES
A SIGN ON DAYTONA BEACH WHERE THE RECORDS ARE MADE.
THE "FIVE GALLON" IS RAPIDLY BEING EXCHANGED FOR FLYING HELMETS BY COWBOYS IN TEXAS.
JONAS RAUSCH LITERALLY JUMPED OUT OF HIS SHOES WHEN HIT BY AN AUTOMOBILE. Allentown, Pa. 1932.
WHEN HER PLANE CAME DOWN IN THE MEDITERRANEAN, WINIFRED SPOONER SWAM TWO MILES IN THE SEA AT NIGHT TO BRING AID TO HER INJURED MALE COMPANION.
SIR MALCOLM CAMPBELL
IS PROFOUNDLY SUPERSTITIOUS AND A GREAT BELIEVER IN CRYSTAL BALLS, STAR GAZING AND PALM READING.

Most Drastic Motor Bills Fail to Pass

N.A.C.C. Survey of 14 States Discloses Few Harmful Laws Enacted

Fourteen state legislatures have adjourned their regular 1933 sessions.

They are: Arizona, Arkansas, Idaho, Indiana, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming, West Virginia and Georgia.

Available information on the legislation enacted in these states indicates that most of the drastic measures proposed by motor transport, opponents, were killed before the sessions closed.

While not proposed by anti-truck interests, a law of considerable concern to those interested in motor transport was enacted in North Dakota providing for diversion of one third of the gasoline tax to meet real estate bonds issued by the state banks and for rural schools and poor relief.

Indiana enacted several laws on taxation and regulation applying solely to commercial vehicles for-hire. Among these was a statute providing for business regulation embracing both common and contract carrier trucks under the control of the Public Service Commission.

Another new Indiana law provides for the collection by the Secretary of State, of $1.00 for each 100 pounds of the weight of trucks, trailers and semi-trailers operated for hire on the public highways outside of cities.

Because of the protests against excessive taxation by truck using groups in South Dakota, a law was passed in that state reducing truck registration fees 50 per cent and repealing a gross receipts tax. Sixty-five per cent of the trucks in South Dakota are farm-owned. Combinations of vehicles in South Dakota were cut in length from 50 to 38½ feet and single vehicles from 50 to 28½ feet.

In Kansas where the legislature has not yet adjourned legislation was passed reducing the fees on trucks of capacities from ½ to 1½ tons and increasing fees on trucks from 2-tons to 5-tons and over.

Export Outlook Improving

WASHINGTON, D. C.—Commerce Department reports on conditions in foreign automotive markets for the month of February show some improvement of sales in Portugal, the Netherlands and Mexico. During the final quarter of 1932, passenger car sales in Mexico were from 85 to 100 per cent better than in the corresponding period of 1931. In Puerto Rico, there has been a slight increase of late in truck sales. For the year 1932 in Australia, total passenger car sales actually exceeded 1931 and there was only a small loss in sales of trucks. In Egypt general automotive imports in December exceeded the same month in the previous year by about 35 per cent while a somewhat more optimistic attitude toward an increase in sales was noted among Egyptian dealers. In Argentina, it is generally believed that February registrations would have been nearly double had stocks of certain new American cars been available.

February Sales 78,500

PHILADELPHIA—February registrations of new passenger cars in the United States amounted to 69,000 units, against 83,000 a year ago and 79,800 for January of this year, according to estimates based on returns from 46 States. The decline from February, 1932, amounts to about 17 per cent and from January, 1933, to 13.5 per cent. Truck sales in February approximated 9500, making the total for the month 78,500.

A. O. Smith to Make Kegs

MILWAUKEE,—A. O. Smith Corp. is busy removing machinery from an obsolete frame plant to provide space for the manufacture of stainless steel beer kegs.

CALENDAR OF COMING EVENTS

CONVENTIONS

National Battery Manufacturers Assoc. Louisville, Ky. .....May 1-2

MEETINGS

National Machine Tool Builders Assoc. Annual Meeting, Cleveland, April 24-25
Natl. Foreign Trade Council, Annual, Pittsburgh .....April 26-28
U. S. Chamber of Commerce Meeting, Washington, D. C. .....May 2-5
American Gear Mfg. Assoc., Wilkinsburg, Pa. .....May 4-6
Natl. Automobile Chamber of Commerce, Annual, New York City. June 8
Natl. Retail Hardware Assoc., Indianapolis .....June 12-16
American Society for Testing Materials, Chicago .....June 26-30
Automotive Engine Rebuilders Assoc., Annual, Chicago .....July 10-14
American Chemical Society, Chicago Sept. 11-15
Natl. Safety Council, Chicago....Oct. 2-6
National Metal Congress, Detroit. Oct. 2-6
American Petroleum Institute, Annual, Chicago .....Oct. 24-26

SECTION MEETINGS—S. A. E.

Baltimore .....April 20
Buffalo .....April 18
Canadian .....April 19
Cleveland .....April 10
New York (Metropolitan) .....April 20
New England (Boston) .....April 12
Northern California .....April 19
Northwest .....April 22
Oregon .....April 21
Philadelphia .....April 12
Pittsburgh .....April 25
Southern California .....April 17
Washington .....April 19

Labor's Purchasing Power Reduced 53.7%

Conference Board Finds Industrial Population Lost Over Half of Income

NEW YORK—The industrial population of the United States has lost more than half of the purchasing power that it possessed in 1929, according to studies recently completed by the National Industrial Conference Board. Computations based on these data indicate that purchasing power available today, at today's wages and prices, is only 46.3 per cent of what it was in 1929.

The Conference Board studies show that since 1929 industrial wage rates have been reduced 19.3 per cent; that working hours of employed workers have been shortened on the average 26.9 per cent; and that the volume of employment has declined 43.4 per cent. When these factors are combined, it is found that the industrial population as a whole, including both employed and unemployed, is receiving only 33.4 per cent as many dollars in wage income as in 1929. But in the meantime prices have declined, with the result that a dollar goes further than it did three years ago. This fact is taken into account by adjusting the amount of income received according to the decline in prices represented by the cost of living index.

Commenting on the significance of its findings, the Conference Board says: "Whether the figure 46.3 represents exactly the present reduced purchasing power or whether it varies slightly one way or the other is immaterial. The significant fact is that it is less than half of what it was when industry was active. When one of the largest and most dependable markets of American industry has contracted by more than one half, it is small wonder that efforts to increase industrial activity meet with little encouragement."

Michigan Steel Tube Report

DETROIT — Michigan Steel Tube Products has reported for year ended Dec. 31, 1932, net loss of $235,543 after depreciation, compared with net loss of $114,113 for 1931.

Current assets as of Dec. 31, 1932 totaled $267,386 and current liabilities $168,664 against $318,512 and $38,033 respectively at the end of 1931.

Miss Matheson Weds

DETROIT — Miss Mary Fuller Matheson, daughter of Mr. and Mrs. Charles W. Matheson, was married recently to Charles Webber Bissell of Grand Rapids. C. W. Matheson is general salesmanager of Graham-Paige Motors.

P. & W. "Twins" Exceed Power Ratings in Official Tests

(Continued from page 435)

pinions and their needle bearings are mounted on eccentric shafts and all shafts are so linked together as to evenly divide the load between pinions.

The propeller shaft, which is a nickel steel forging, is carried on two widely spaced bearings. The forward one of these, which is carried in the nose section just behind the propeller, is of the anti-friction type and takes both radial and thrust loads. The rear bearing is a plain bearing inside the forward end of the crankshaft. It is pressure-lubricated.

The nose-section housing is made of aluminum alloy and heat treated. An oil sump is cast integral with this section and is so arranged that the engine will scavenge properly even during a steep dive. A short intermediate piece closes the rear end of the front section, being bolted between it and the main crankcase.

Pressure lubrication is provided for all bearings except those of the rocker arms, which latter are provided with Zerk oilers. In addition to the sump on the front section there is another one secured to the main and rear sections. Oil from the supply tank passes through the pressure pump and thence through a strainer accessibly located in the rear section. The oil is then fed into the crankshaft, whence it passes to all parts arranged for pressure lubrication. The oil relief valve is so arranged that the by-passed oil need not be returned to the tank but may be delivered to the suction side of the pressure pump. Two oil scavenging pumps drain the oil from their respective sumps and deliver it to the oil supply tank through a suitable oil cooler.

The exhaust system ordinarily used consists of a collector ring carried on the engine mounting, into which each cylinder discharges through a short length of pipe. A system of baffles serves to combine adequate cooling with minimum drag. It includes a ring around the engine between the front and rear cylinders, which also serves as a support for the outer cowl.

Both engines are fitted with a special valve and oil-transfer bearing located in the front section immediately behind the thrust bearing, for the purpose of supplying oil for the Hamilton-Standard hydraulically - operated controllable - pitch propeller. This feature makes it possible to use the type of propeller mentioned at any time without making structural changes in the engine.

French Exports Off One-Third

FRENCH foreign commerce in motor vehicles dropped approximately one-third last year as compared with 1931, according to a report from H. C. Schuette, U. S. assistant automotive trade commissioner at Paris. Imports of automotive products into France decreased 36 per cent in value, while exports of such products from France decreased 35 per cent. In actual value the French imports amounted to about $5,457,000 in 1932 and $8,490,000 in 1931, and the imports to $22,184,600 in 1932 and $34,022,000 in 1931. This gives France a favorable trade balance in the proportion of about 4 to 1, and when only automobiles and motor trucks are considered the showing is even more favorable, for the proportion of vehicles exported to those imported is about 7 to 1.

A total of 1615 complete passenger cars and 174 complete trucks were imported during the past year, as compared with 2419 complete cars and 349 complete trucks in 1931. This does not include parts for about 10,500 American and Italian cars and trucks assembled in France during 1932.

The United States continued to be the principal supplier of automobiles to France during the year. Of the 10,500 vehicles assembled locally, all but about 800 Fiats (which are assembled from a very large percentage of French parts) were of American design. Of complete cars and trucks, 394 came from the United States, 365 from England, 357 from Belgium, 339 from Germany, and 116 from Italy. Of chief interest is the fact that England, largely due to its depreciated exchange, jumped from fifth place in 1931 to second place in 1932. Most of the English and German cars were small cars.

Of considerable importance is the large amount of parts and accessory imports shipped into this country from America. The United States supplied about 66 per cent of the total, or 48,510 metric quintals out of 73,418, a considerable proportion of which consist of parts for assembly.

France exported 14,495 passenger cars, 1776 complete trucks and 2945 chassis, a total of 19,206 vehicles, during 1932, as compared with a total of 26,318. In addition, about 3500 French cars and trucks (Citroens) were assembled in foreign countries during the past year. The French colonies took 11,081 of these vehicles, or about 58 per cent of the total.

Honing Big End Bores

(Continued from page 438)

Each rod is held in independent full-floating holders, while the hone is guided in a vertical plane, in bushings located above and below the work. Rods are aligned with inserted fiber wiper guides between the stones on the hone, preventing marring of finished rod bores when stones are collapsed for withdrawal of the hone.

Production rate is claimed to be over 300 rods per hour per machine. Plymouth rods receive one honing operation following a broaching operation.

In the case of the Ford rods, which ride directly on a floating bearing in the crankshaft journal, two honing operations are called for, roughing and finishing, the first for accuracy, the second for surface finish. In either case rods are finished to within .0003 in. for roundness and straightness of the bore.

Successful operation of this setup, finishing several parts simultaneously, is claimed to be due to the departure from general honing practice insofar as the hone is piloted while the work is floated, instead of attempting to maintain a rigid mounting for each of the parts to be finished. The resilient fiber guides on the honing steel extend beyond the ends of the floating stones to assure accurate piloting.

The *Quick* Stop

Make These Comparative Tests Yourself

For ordinary braking, not much foot pressure is required on the old-fashioned, high brake pedal used on "Partial Power" Brakes. But for a quick stop, almost the same amount of leg muscle and lunging leg action is required as on leverage brakes.

The modern brake pedal of Stewart-Warner Automatic "Full Power" Brakes is no higher than a foot accelerator because *all* the actual work of braking at any speed is done by a power unit. The application of the braking force is controlled with the same slight rocking foot motion as used on the accelerator.

See the STEWART WARNER EXHIBIT 1933 A CENTURY OF PROGRESS

STEWART-WARNER

Shows Up The Difference! . . .

. . . . and what a *difference* it is

Quick Facts that every Car Factory Executive and Engineer should know regarding Stewart-Warner Automatic "Full Power" Brakes as contrasted to "Partial Power" Brakes.

ONLY "FULL POWER" can give *all* the advantages of "Power Braking."

"Partial Power" Brakes—that use booster devices to assist leg muscle—cannot meet this demand fully for *two* reasons. One reason is that vital split-seconds are wasted in raising the foot from the accelerator to the high brake pedal that must be used with this type of brake. The other reason is, that while for ordinary braking, light pedal pressure may suffice; for an emergency stop or when the engine stops, these brakes require as much, or more, leg action and leg muscle as old-fashioned leverage brakes. Thus they fail to give the big advantages of "power" at the critical times when the *need* for "full power" is most urgent.

Stewart-Warner Automatic "Full Power" Brakes meet today's need. The power unit does all the work of braking at any speed, in any emergency. The brake control pedal is no higher than a foot accelerator.

The outstanding advantages they offer in instant, accurate response and effective operation can be demonstrated conclusively.

Stewart-Warner Automatic "Full Power" Brakes, factory installed on motor cars, motor coaches or trucks, due to their simplicity, insure great savings in both maintenance and adjustment costs. Investigate. Our engineers are at your command.

Stewart-Warner Corporation, Brake Division, Chicago, U.S.A., or 6050 Cass Ave., Detroit, Mich.

Stewart-Warner Automatic "FULL POWER" Brakes Will Do More To Boost Car Sales Than Any Other Feature

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Automatic
"FULL POWER" BRAKES

PIG IRON
SEMIFINISHED STEEL
BARS & SHAPES

SKELP
SHEETS
PIPE
SPECIALTIES

ENDURO-REPUBLIC'S PERFECTED STAINLESS STEEL
AGATHON ALLOY STEELS

REPUBLIC STEEL CORP.
YOUNGSTOWN, OHIO

Pioneers in Better Drilling Methods

FOOTBURT

Single and multiple splindle special drilling, boring, reaming, tapping machine and FOOTBURT Sipp Sensitive Drilling Machines
THE FOOTE-BURT COMPANY CLEVELAND, OHIO

BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 36

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Ammeters
General Electric Co.

Axles
Spicer Mfg. Corp.

Bending & Straightening Machines
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Boring Machines
Foote-Burt Co.

Brake Testers
Bendix Aviation Corp.

Brakes
Mechanical
Bendix Aviation Corp.
Spicer Mfg. Co.
Stewart-Warner Corp.
Power
Bendix Aviation Corp.
Stewart-Warner Corp.

Bumpers
Stewart-Warner Corp.

Bushings
Fibre
Continental-Diamond Fibre Co.

Cable, Brake or Cutout Control
Wickwire Spencer Steel Co.

Cable, Ignition, Starting & Lighting
General Electric Co.

Carburetors
Bendix Aviation Corp.

Channels for Glass
Felt
American Felt Co.

Cleaners
Metal
American Chemical Paint Co. (Rust Preventive)

Couplings, Shaft
Spicer Mfg. Corp.

Cups, Lubricating
Gits Bros. Mfg. Co.

Drilling Machines
Foote-Burt Co.

Enamels
American Chemical Paint Co. (Rust Proofing)

Felt
American Felt Co.

Fenders
Motors Metal Corp.

Fibre, Rods, Sheets, Tubes
Continental-Diamond Fibre Co.

Furnaces, Electric
(Annealing, Carburizing, Heat Treating, Forging & Welding)
Electric Furnace Co.

Gaskets
Felt
American Felt Co.

Gear Material
Non-Metallic
Continental-Diamond Fibre Co.

Gears, Timing
Non-Metallic
Continental-Diamond Fibre Co.
General Electric Co.

Hammers, Power
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Heaters, Car
Stewart-Warner Corp.

Heat Treating
Barnes-Gibson-Raymond, Inc.
Barnes Co., Wallace
Gibson Co., Wm. D.

Hoods
Motors Metal Corp.

Hose, Flexible Metallic (Radiator & Fuel Lines)
Titeflex Metal Hose Co.

Insulating Material
Continental-Diamond Fibre Co.

Lathes
Automatic Chucking
Potter & Johnston Machine Co.
Turret
Potter & Johnston Machine Co.

Lighting Equipment, Electric
Factory
General Electric Co.

Lubricators, Chassis
Gits Bros. Mfg. Co.

Molded or Machined Parts (Phenolic)
Continental-Diamond Fibre Co.

Motors, Electric Power
General Electric Co.

Oil
Brake In
Acheson Oildag Co.
Lubricating
Acheson Oildag Co.

Pads
Felt
American Felt Co.

Panels, Instrument
American Chemical Paint Co. (Heat Resisting)

Pickling Compounds
American Chemical Paint Co.

Piston Rings
Perfect Circle Co.

Powerplants, Industrial
General Electric Co.

Presses
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Radiators
Harrison Radiator Corp.

Radiator Shells
Motors Metal Corp.

Regulators, Oil Temperature
Harrison Radiator Corp.

Removers, Enamel & Paint
American Chemical Paint Co.

Rivets
Progressive Mfg. Co.

Running Boards, Metal
Motors Metal Corp.

Rust Removers & Preventives
American Chemical Paint Co.

Screw Machine Products
Barnes Co., Wallace
Progressive Mfg. Co.

Screw Machines
Potter & Johnston Machine Co.

Screws
Machine
Progressive Mfg. Co.

Shafts, Axle, Propeller & Transmission
Spicer Mfg. Corp.

Shock Absorbers
Stewart-Warner Corp.

Speedometers & Tachometers
Stewart-Warner Corp.

Springs
Extension, Compression, Torsion or Flat
Barnes-Gibson-Raymond, Inc.
Barnes Co., Wallace
Cook Spring Co.
Gibson Co., Wm. D.
Raymond Mfg. Co.
Wickwire Spencer Steel Co.

Stampings or Drawings, Metal
Barnes-Gibson-Raymond, Inc.
Barnes Co., Wallace
Cook Spring Co.
Gibson Co., Wm. D.
Motors Metal Corp.
Raymond Mfg. Co.
Wickwire Spencer Steel Co.
Worcester Stamped Metal Co.

Starter Drives
Bendix Aviation Corp.

Steam Cooling
Rushmore Laboratory

Steel
Alloy
Republic Steel Corp.
Bars
Republic Steel Corp.
Carbon
Republic Steel Corp
Wickwire Spencer Steel Co.
Cold Drawn
Republic Steel Corp.
Wickwire Spencer Steel Co.
Shapes
Wickwire Spencer Steel Co.
Spring
Barnes-Gibson-Raymond, Inc.
Barnes Co., Wallace
Gibson Co., Wm. D.
Stainless
Amer. Stainless Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel Co.
Strip
Republic Steel Corp.
Wickwire Spencer Steel Co.

Tapping Machines
Foote-Burt Co.

Tubing
Flexible Metal
Titeflex Metal Hose Co.

Turret Machines, Automatic
Potter & Johnston Machine Co.

Universal Joints
Spicer Mfg. Corp.

Vacuum Tanks
Stewart-Warner Corp.

Washers
Felt
American Felt Co.

Welders, Electric
General Electric Co.

Welding Material (Wires)
Wickwire Spencer Steel Co.

Wicks
Felt
American Felt Co.

Windshield Wipers
Stewart-Warner Corp.

Wire
Flat, Round, Square or Special Shape
Barnes Co., Wallace
Spring
Barnes Co., Wallace
Republic Steel Corp.
Wickwire Spencer Steel Co.

Classified Advertising

AUTOMOTIVE EXECUTIVE—Twenty-three years in industry; passenger car, truck, tractor and accessory fields. Experience covers sales, production, engineering and research. Open to proposition as sales representative of reliable manufacturer in Detroit area. Excellent contacts with major manufacturers. Absolutely responsible and satisfactory references. Box 852, AUTOMOTIVE INDUSTRIES.

SALISBURY FRONT AND REAR AXLES

SALISBURY Axles have acquired a reputation for silent running heretofore unattained in passenger car axles. Due to rigidity in construction and unusual accuracy in manufacture and assembly, the gears are maintained in their original position thus eliminating the necessity of the customary service adjustments.

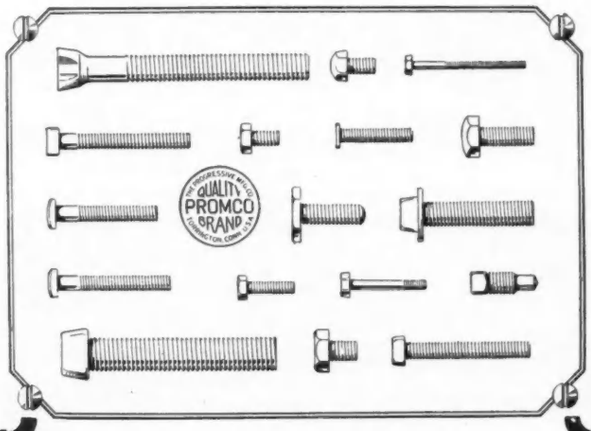
All axles are assembled and tested by the use of micrometer type fixtures and gauges which assure the selection of the best operating position for long life and quiet operation.

Spicer

MANUFACTURING CORPORATION

TOLEDO, OHIO

BROWN-LIPE CLUTCHES and TRANSMISSIONS | SALISBURY FRONT and REAR AXLES | SPICER UNIVERSAL JOINTS | PARISH FRAMES READING, PA.



MACHINE SCREWS
MACHINE SCREW NUTS

In Stock at All Times

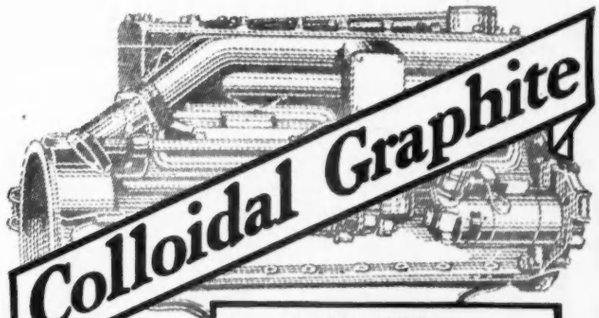
Our products are made on both a quality and price basis. Their uniformity insures you against slowing down in your assembly operations.

We make a great variety of special screws to order, and our specialists will be glad to consult with you without obligation.

Their advice may prove of mutual advantage. Get in touch with us.

The PROGRESSIVE MFG. CO.
TORRINGTON, CONN., U. S. A.

The illustration indicates a few of the many special parts that we have developed for other manufacturers



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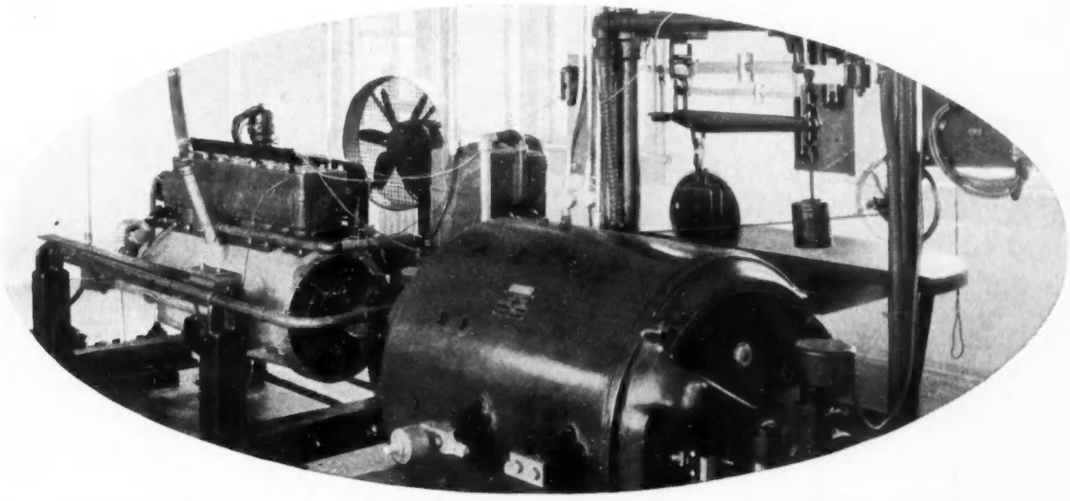

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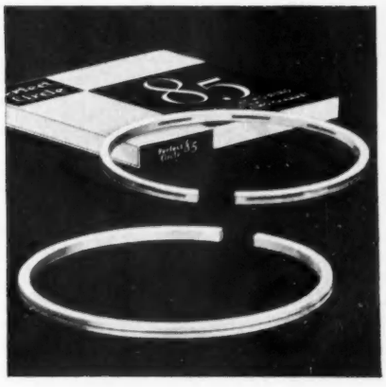

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